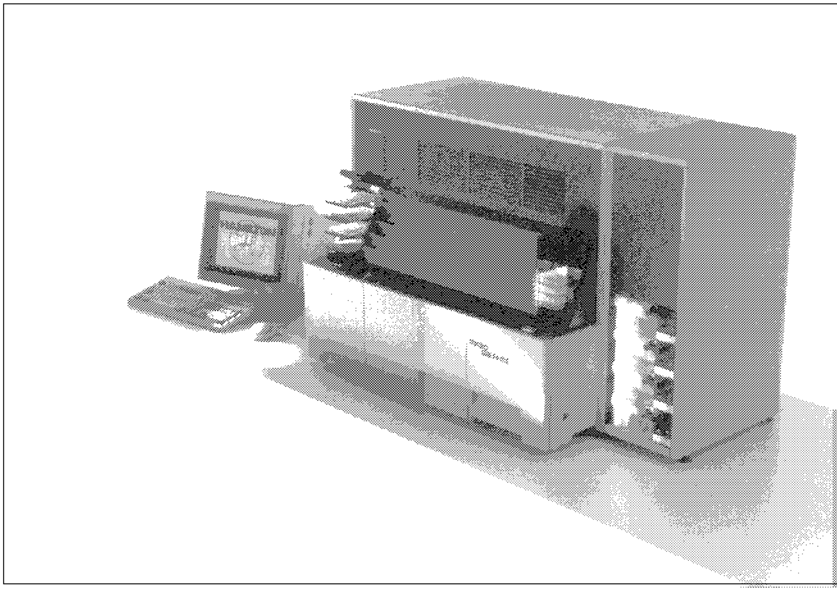
Microlab F.A.M.E.

Service MANUAL

Version 2.0



P / N 610015

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Instrument	Microlab F.A.M.E.
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CHAPTER 1 SYSTEM

1.1 ML F.A.M.E. Instrument

1.1.1 General Information

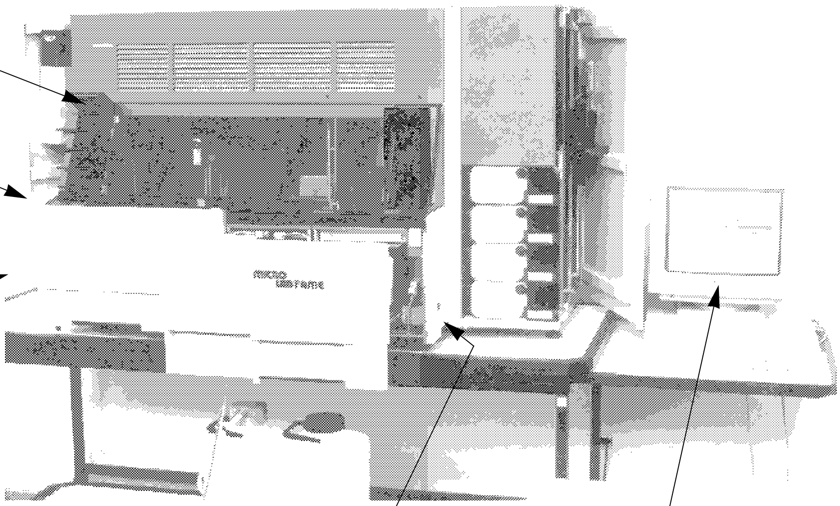
Refer to User Manual Chapter 1.

ATTENTION
Read Chapter 1, General Instructions, of the User Manual before repairing / servicing the system.

For specific Service Information read section 1.1.2 Service Concept.

ATTENTION
Never lift a fully installed (assembled) instrument from one work bench to another. It must first be dismantled and then reinstalled on the new work bench.

Location of Warning and Attention Labels



Attention: Do not swap plates after loading

Power ⚠ ⚡
Serial No.

CE Label

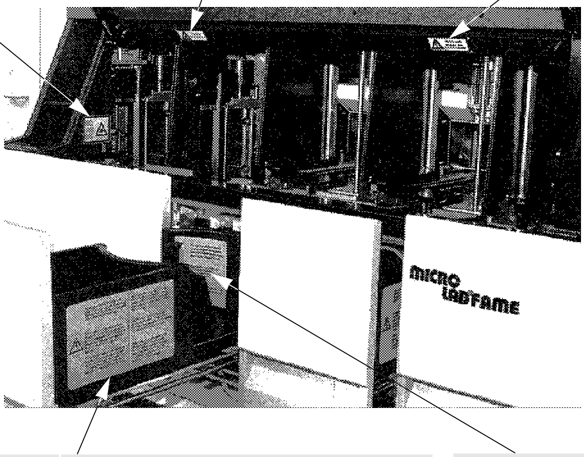
PAUSE
(Pause Button)

Attention: Shut down OS/2 before switching off PC.
Do not change the OS/2 system time during a run.

Warning: Laser Beam
Do Not Stare Into Beam!
Class 2 Laser

Warning: BIOHAZARD

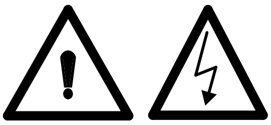
Warning: ⚠ Moving Parts



Attention: Turn carousel until it drops into locked position. Ensure all plungers are pushed down and caps are properly closed.

Before removing the module decontaminate the instrument, unplug all the connectors and seal the fluid system as described in the manual.

Attention: Close the reagent drawer gently to prevent spillage. Do not fill containers above the “max. 100 ml” mark.



Power Connection:

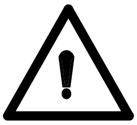
Connect only to earth grounded outlet

115V~/...A 60Hz

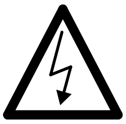
230V~/...A 50Hz

The pause button should generally not be pressed unless instructed by the user software as plate processing may be interrupted leading to aborted plate. Carefully follow the software instructions.

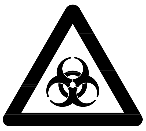
Warning Symbols



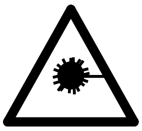
General
Warning



Danger
High Voltage

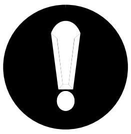


BIOHAZARD
HANDLE WITH CARE

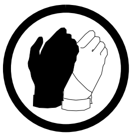


Danger
Laser

Command Symbols



General
Command



Wear
Gloves

1.1.2 Service Concept

1.1.2.1 General Information

This Service Manual is a field service guide and is to be used only by Service Technicians trained and/or authorized by Hamilton Bonaduz AG.

Repaired units must meet the quality standards set by Hamilton Bonaduz AG.

No part of this manual may be copied or handed on to a third party. Owners of Service Manuals are registered and only they will be issued with update information such as Service Manual Updates and Service Bulletins.

ATTENTION
In order to prevent infections caused by an unclean instrument in clinical environments (blood banks etc.), contaminated parts to be touched while repairing should be cleaned and sterilised - a precautionary measure of greatest importance.

Only after cleaning and disinfecting should repairs be carried out.

In order to protect the Service Personnel from contagion, protective vaccination is advised.

1.1.2.2 ML F.A.M.E. Service Manual

The ML F.A.M.E. Service Manual is designed to visually guide the service technician to the appropriate section as quickly as possible. It consists of 6 chapters:

1 SYSTEM

2 ENTRY MODULE

3 INCUBATOR MODULE

4 WASHER / DISPENSER

5 END MODULE

6 INSTRUMENT FRAMEWORK

- Chapter 1 serves as an introduction to the ML F.A.M.E. instrument and the ML F.A.M.E. manual. Service technicians must read chapter 1 in order to provide the best service.
- Chapters 2-6 contain the servicing instructions.

1.1.2.2.1 Description of text icons

Attentions and useful notes are included in this manual to emphasize important and critical instructions. They are accompanied by a special symbol in the margin of the page and are printed in italics.

ATTENTION
All special problems, warnings or important text will be accompanied by this symbol at the appropriate position.

NOTE
Text associated with this symbol provides the user with useful notes. Carefully read the text as it is important for understanding the specific topic/command.

1.1.2.2.2 Updating the Service Manual

As the instrument or parts of the instrument are constantly being improved, this Service Manual will regularly be updated. Each Service Technician will be sent update-sets and is responsible that his Service Manual is kept up to date. Necessary instructions of how to do this will be included in the update-set.

It is most important that your Service Manual is kept up to date. On receipt of an Update, carefully follow the instructions on the cover page and then file the cover page after this section.

1.1.2.2.3 Service Bulletins

Service Bulletins are sent to *immediately* inform the Service Technician. File the Bulletins in this section to keep the Manual up to date.

1.1.2.2.4 Service Part Classifications

Spare Part Class (SPC)	Description
I	Instrument
A	Service Technician always has these parts with him
B	Dealer has part in stock
C	Hamilton has part in stock
P	Promotion Material
T	Service Tools
V	Consumables
Z	Accessories
	Not a Spare Part

1.1.2.2.5 Service Assemblies

Parts labelled with *part* numbers rather than *item* numbers on the 3D drawings are *Service Assemblies* and should not be disassembled by the Service Technician. If a part of the assembly is defective, the whole assembly must be replaced.

1.1.2.2.6 ML F.A.M.E. instruments with CE conformity

Instruments with serial numbers greater than 2000 are CE conform. Below is a table listing which board revisions may be installed into CE conform instruments.

Description	Part Number	New Revisions CE Conform
Motherboard E PCB	146 164	01
Motherboard W/D PCB	146 168	01
Motherboard P PCB	146 170	01
Incubator PCB	146 178	03
Entry PCB	146 176	03
Exit PCB	146 186	03
Power Supply 2 PCB	146 172	04
Power Supply 1 PCB	146 284	04
External Pump Station PCB	146 240	02

ATTENTION

The following boards (including those with a lower revision) must not be used in CE-conform instruments: Incubator PCB 146178/02, Exit PCB 146186/02, Power Supply 2 PCB 146172/03, and External Pump Station PCB 146240/01.

1.1.2.2.7 Pin coding for PCBs

- = **Pin fitted**

Type: **Codes for Processor Boards**: **Codes for Motherboards**:

Codes for Processor Boards:

Type	A	B	C	D	E	F	G	H	I	K	L	M
UP 1	●		●	●	●	●						●
UP 2	●		●	●	●		●					●
UP 3	●		●	●	●			●				●
UP 4	●		●	●	●				●			●

Codes for Motherboards:

Type	A	B	C	D	E	F	G	H	I	K	L	M
UP 1		●						●	●	●	●	
UP 2		●				●		●	●	●	●	
UP 3		●				●	●		●	●	●	
UP 4		●				●	●			●	●	

Codes for Peripheral Boards:

Type	A	B	C	D	E	F	G	H	I	K	L	M
Power Supply 1 PCB		●	●	●					●	●	●	
Power Supply 2 PCB		●	●		●				●	●	●	
Entry		●	●	●				●		●	●	
Incubator		●	●	●	●		●				●	
Step Motor		●	●	●	●			●			●	
Dispenser		●	●	●	●				●		●	
Washer		●	●	●	●					●	●	
Exit		●	●	●			●			●	●	

Type	A	B	C	D	E	F	G	H	I	K	L	M
Power Supply 1 PCB	●					●	●	●				●
Power Supply 2 PCB	●			●		●	●	●				●
Entry	●				●	●			●			●
Incubator	●					●		●	●	●		●
Step Motor	●					●	●		●	●		●
Dispenser	●					●	●	●		●		●
Washer	●					●	●	●	●			●
Exit	●				●	●		●	●			●

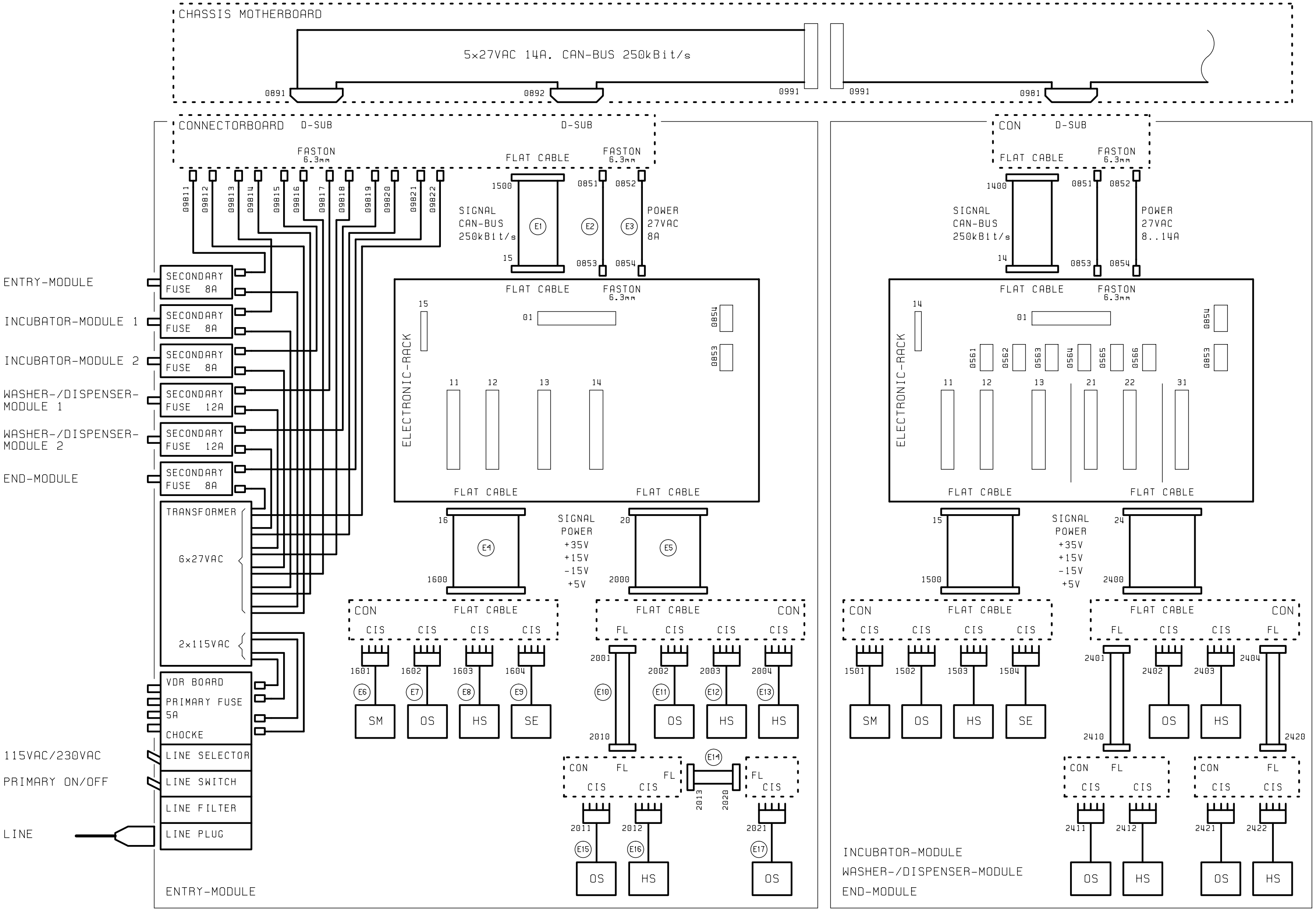
1.1.2.2.8 Connector numbering

The drawing on the following page 614 149 illustrates the connector numbering system used for ML F.A.M.E.

Wiring Principle

Block Diagram 614 149

revision 00


CHASSIS MOTHERBOARD
5x27VAC 14A, CAN-BUS 250kBit/s
0891
0892
0991
0991
0981
CONNECTORBOARD
D-SUB
D-SUB
FASTON 6.3mm
FLAT CABLE
FASTON 6.3mm
09811
09812
09813
09814
09815
09816
09817
09818
09819
09820
09821
09822
1500
15
0851
0852
0853
0854
SIGNAL CAN-BUS 250kBit/s
POWER 27VAC 8A
E1
E2
E3
ENTRY-MODULE
INCUBATOR-MODULE 1
INCUBATOR-MODULE 2
WASHER-/DISPENSER-MODULE 1
WASHER-/DISPENSER-MODULE 2
END-MODULE
SECONDARY FUSE 8A
SECONDARY FUSE 8A
SECONDARY FUSE 8A
SECONDARY FUSE 12A
SECONDARY FUSE 12A
SECONDARY FUSE 8A
TRANSFORMER
6x27VAC
2x115VAC
VDR BOARD
PRIMARY FUSE 5A
CHOCKE
115VAC/230VAC
LINE SELECTOR
PRIMARY ON/OFF
LINE SWITCH
LINE FILTER
LINE
LINE PLUG
ELECTRONIC-RACK
FLAT CABLE
FASTON 6.3mm
01
15
11
12
13
14
0854
0853
FLAT CABLE
FLAT CABLE
16
1600
E4
SIGNAL POWER +35V +15V -15V +5V
20
2000
E5
CON
FLAT CABLE
CIS
CIS
CIS
CIS
1601
1602
1603
1604
E6
E7
E8
E9
SM
OS
HS
SE
FLAT CABLE
CON
FL
CIS
CIS
CIS
2001
2002
2003
2004
E10
E11
E12
E13
OS
HS
HS
2010
CON
FL
FL
CIS
CIS
E14
2013
2020
FL
CIS
2011
2012
2021
E15
E16
E17
OS
HS
OS
ENTRY-MODULE
CON
D-SUB
FLAT CABLE
FASTON 6.3mm
1400
14
0851
0852
0853
0854
SIGNAL CAN-BUS 250kBit/s
POWER 27VAC 8..14A
ELECTRONIC-RACK
FLAT CABLE
FASTON 6.3mm
14
01
0561
0562
0563
0564
0565
0566
0854
0853
11
12
13
21
22
31
FLAT CABLE
FLAT CABLE
15
1500
SIGNAL POWER +35V +15V -15V +5V
24
2400
CON
FLAT CABLE
CIS
CIS
CIS
CIS
1501
1502
1503
1504
SM
OS
HS
SE
FLAT CABLE
CON
FL
CIS
CIS
FL
2401
2402
2403
2404
OS
HS
2410
2420
CON
FL
CIS
CIS
CON
FL
CIS
CIS
2411
2412
2421
2422
OS
HS
OS
HS
INCUBATOR-MODULE
WASHER-/DISPENSER-MODULE
END-MODULE

Numbering System: (P → male, J → female)

Electronic-Rack Connector Numbering:

01 → Power Supply PCB

11 : 14 } PCBs of } 1st Microprocessor System
15 : 19 } Peripheral Connections of } 1st Microprocessor System

21 : 23 } PCBs of } 2nd Microprocessor System
24 : 29 } Peripheral Connections of } 2nd Microprocessor System

Peripheral Connector Numbering:

1600 Connection from El.-Rack (16) to the Connectorboard witch distributes the Signales to the Function Unit.

1601 : 1609 } Output of the CONNECTORBOARD to the Actuators and Sensors.

1610 Input to a further Connectorboard

Cable Numbering:

X n
- n → Number (1...99)
- X → Module Identifier
  - E → Entry-Module
  - I → Incubator-Module
  - W → Washer-/Dispenser-Module
  - P → Photometer-/End-Module

1.1.2.3 Feedback (Quarterly Service Call Statistics)

Information from the field is a determining factor for improving Hamilton products. Please send/fax a copy of all of your Service Reports to Hamilton Bonaduz AG every three months so that we may continue to provide quality products and services.

1.1.2.4 Parts Return Tag

The part Return Tag has two functions:

- ❒ Page 1: Part identification, reason for return and description of problem
- ❒ Page 2: Decontamination Declaration

Material Return Good Authorization

Parts or instruments may only be returned to Hamilton Bonaduz AG with a Return Good Authorization (RGA).

Ask the Hamilton Order Processing Department (OPD) for an RGA number prior to sending any material. This number must be entered in the appropriate blank on the Parts Return Tag.

A completed Part Return Tag must be attached to all parts or instruments which are returned to HAMILTON BONADUZ AG. Tags may be ordered from Hamilton Bonaduz AG (p/n 612 554).

Hamilton Bonaduz AG reserves the right to return any parts or instruments which may pose a health hazard due to contamination and to charge the customer for any expenses incurred.

1.1.2.5 Technical Data Sheet

The technical data sheet is supplied with each instrument and contains all technical data of a specific instrument. It must be updated by the service technician when significant modifications are made.

1.1.2.6 Service Kit

1.1.2.6.1 Service Kit Spare Parts List 148 236

SPARE CASE ML F.A.M.E. REV: 00

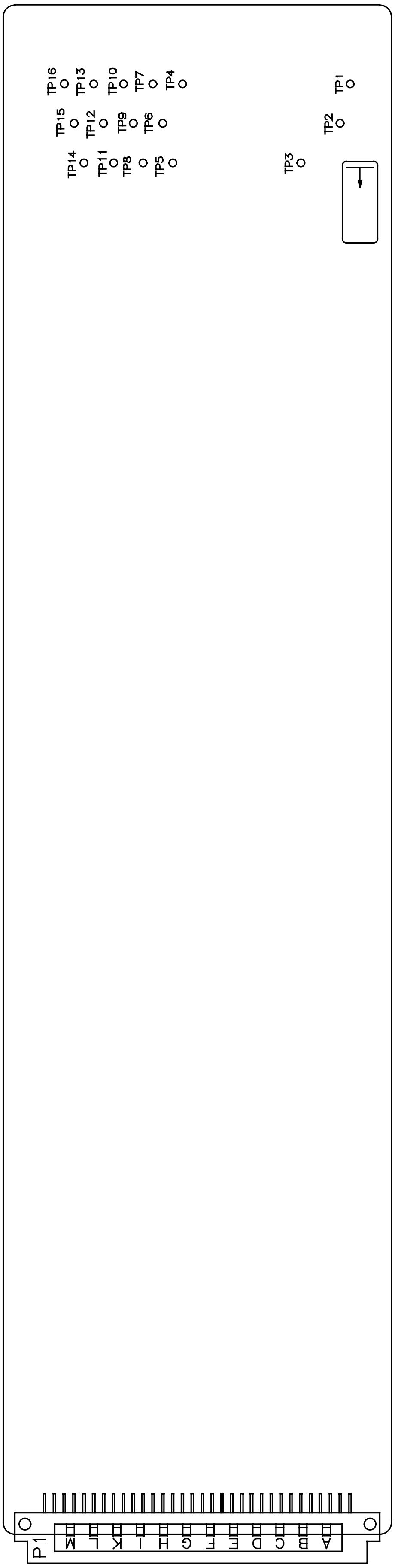
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
141239	KLEMMRING	01	1	1.000	A
146154	CONNECTORBOARD E1 PCB	00	2	1.000	A
146156	CONNECTORBOARD I1 PCB	00	3	1.000	A
146158	CONNECTORBOARD P1 PCB	00	4	1.000	A
146172	POWER SUPPLY 2 PCB	04	7	1.000	A
146174	STEP MOTOR PCB	00	8	1.000	A
146178	INKUBATOR PCB	02	9	1.000	A
146180	DISPENSER PCB	01	10	1.000	A
146182	WASHER PCB	02	11	1.000	A
146186	EXIT PCB	03	12	1.000	A
146188	IC27C256 PRO VEDLS10.ACH	00	13	1.000	A
146195	CONNECTORBOARD W1 PCB	02	14	1.000	A
146197	CONNECTORBOARD W2 PCB	02	15	1.000	A
146201	CONNECTORBOARD W4 PCB	00	16	1.000	A
146407	CONNECTORBOARD W5 PCB	00	17	1.000	A
146209	CONNECTORBOARD W8 PCB	00	19	1.000	A
146411	CABLE W7	00	20	1.000	A
146218	CABLE W8	00	21	1.000	A
146222	CABLE W12	00	22	1.000	A
146230	CONNECTORBOARD W11 PCB	00	23	1.000	A
146232	CONNECTORBOARD W12 PCB	00	24	1.000	A
146234	CONNECTORBOARD W13 PCB	00	25	1.000	A
146236	CONNECTORBOARD W14 PCB	00	26	1.000	A
146240	EXTERNAL PUMP STATION PCB	02	27	1.000	A
146243	PHOTOMETER PROCESSOR PCB	00	29	1.000	A
146244	CONNECTORBOARD P20 PCB	00	30	1.000	A
146245	LAMP CONTROLLER PCB	00	31	1.000	A
146256	CONNECTORBOARD W9 PCB	01	32	1.000	A
146257	CONNECTORBOARD E8 PCB	00	33	1.000	A
146259	CONNECTORBOARD P2 PCB	00	34	1.000	A
146261	CONNECTORBOARD P3 PCB	00	35	1.000	A
146263	CONNECTORBOARD P4 PCB	00	36	1.000	A
146265	CONNECTORBOARD P5 PCB	00	37	1.000	A
146266	CONNECTORBOARD P6 PCB	00	38	1.000	A
146268	CONNECTORBOARD P9 PCB	00	39	1.000	A
146271	CONNECTORBOARD P8 PCB	00	40	1.000	A
146275	LAMP-ASSEMBLY PCB	00	41	1.000	A
146278	CONNECTORBOARD W16 PCB	01	42	1.000	A
146298	CABLE W44	00	43	1.000	A
146308	TEMPERATURE SENSOR TS70	00	44	1.000	A
146311	CONNECTORBOARD E6 PCB	00	45	1.000	A
146312	CONNECTORBOARD E7 PCB	00	46	1.000	A
146313	CONNECTORBOARD E9 PCB	00	47	1.000	A

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
146314	CONNECTORBOARD E10 PCB	00	48	1.000	A
146322	CONNECTORBOARD E11 PCB	00	49	1.000	A
146352	CABLE E20	00	50	1.000	A
146384	A/D CONVERTER PCB	00	53	1.000	A
146386	CONNECTORBOARD E14 PCB	00	54	1.000	A
146388	CONNECTORBOARD E12 PCB	00	55	1.000	A
146390	CONNECTORBOARD E13 PCB	00	56	1.000	A
147417	ISOLIERSCHEIBE	00	58	1.000	A
147489	SCHWIMMER	01	59	1.000	A
147638	KABELKLEMME	00	61	1.000	A
147683	FILTERMATTE	00	62	1.000	A
147693	VERBINDUNGSSTUECK NW 8/45?	00	63	1.000	A
147720	SHELL-FEDER	00	64	1.000	A
147777	ABDECKFOLIE	00	65	1.000	A
147935	MTP-TRANSPORTER	00	66	1.000	Z
148157	KONTAKTFEDER	00	67	1.000	A
148228	MODULE TRANSPORT FORK COMPL.	01	68	1.000	A
148230	REGULATING SCREW 1 COMPL.	00	69	1.000	A
148231	REGULATING SCREW 2 COMPL.	00	70	1.000	A
249944	SCHLAUCHVERBINDER 6/10/6	00	71	1.000	A
254101	O-RING 85.32x3.53 VITON 75	00	72	1.000	A
254106	O-RING 12.00X2.00 VITON	00	73	1.000	A
254110	O-RING 76.00X2.00 VITON	00	74	1.000	A
254111	O-RING 5.00X1.50 VITON	00	75	1.000	A
254121	O-RING 79X2 NBR 70.5/P5	00	76	1.000	A
256115	ZUGFED. D 0,32 DA 3,52 LO 12,9	00	77	1.000	A
256116	ZUGFEDER D 0.50 DM 3.0 LO 24.5	00	78	1.000	A
257036	DISTANZHALTER M3 X 8 I/I GEW.	00	79	1.000	A
257040	DIST.HALTER M4X20 I/A GEW.	00	80	1.000	A
257041	DIST.HALTER M4X 25 I/A GEW.	00	81	1.000	A
279448	SCHWINGUNGSDAEMPFER D=15 H=20		83	1.000	A
279648	WINKELSTUECK 90? PP ID 4-5	00	84	1.000	A
279649	WINKELSTUECK 90? PP ID 8-9	00	85	1.000	A
361019	KABELBEF. SES-CT	00	86	3.000	
422002	SPREIZNIETE KST D=5 KB=3.5-4.5	00	90	1.000	A
420214	PT-SENKKOPFSCHRAUBE KA 30 X 8	00	91	2.000	A
7279355	KLEBBAND 1-SEITIG D= 2 B= 6	00	92	0.200	
147963	PHOTOMETER AIR FILTER	00	93	1.000	A
511006	LOCTITE 222 50mL	00	94	1.000	T
511010	LOCTITE 638 50mL	00	96	1.000	T
7249057	SILIKONSCHL 4 X 7 TRANSP	00	97	1.000	B
7260010	SILIKONSCHL 8 X12 TRANSP	00	98	1.000	B
148248	KLETTVERSCHLUSS	00	99	4.000	A
7281149	PTFE-KLEBEBAND EXTR.B=9MM	00	100	0.200	
7281122	KLEBBAND 2-SEITIG D=0,8 B=9	00	101	0.200	
146328	TRANSPARENT COVER SENSOR HS03	00	102	1.000	A
146416	REAGENT DRAWER SWITCH SET	00	103	1.000	A
254105	O-RING 8.00X2.00 VITON	00	104	1.000	A
254126	O-RING Di 5x2.5 VITON 75	00	105	1.000	A
281110	STOPFEN D5.8 D7 L5 SILIKON	00	106	1.000	A

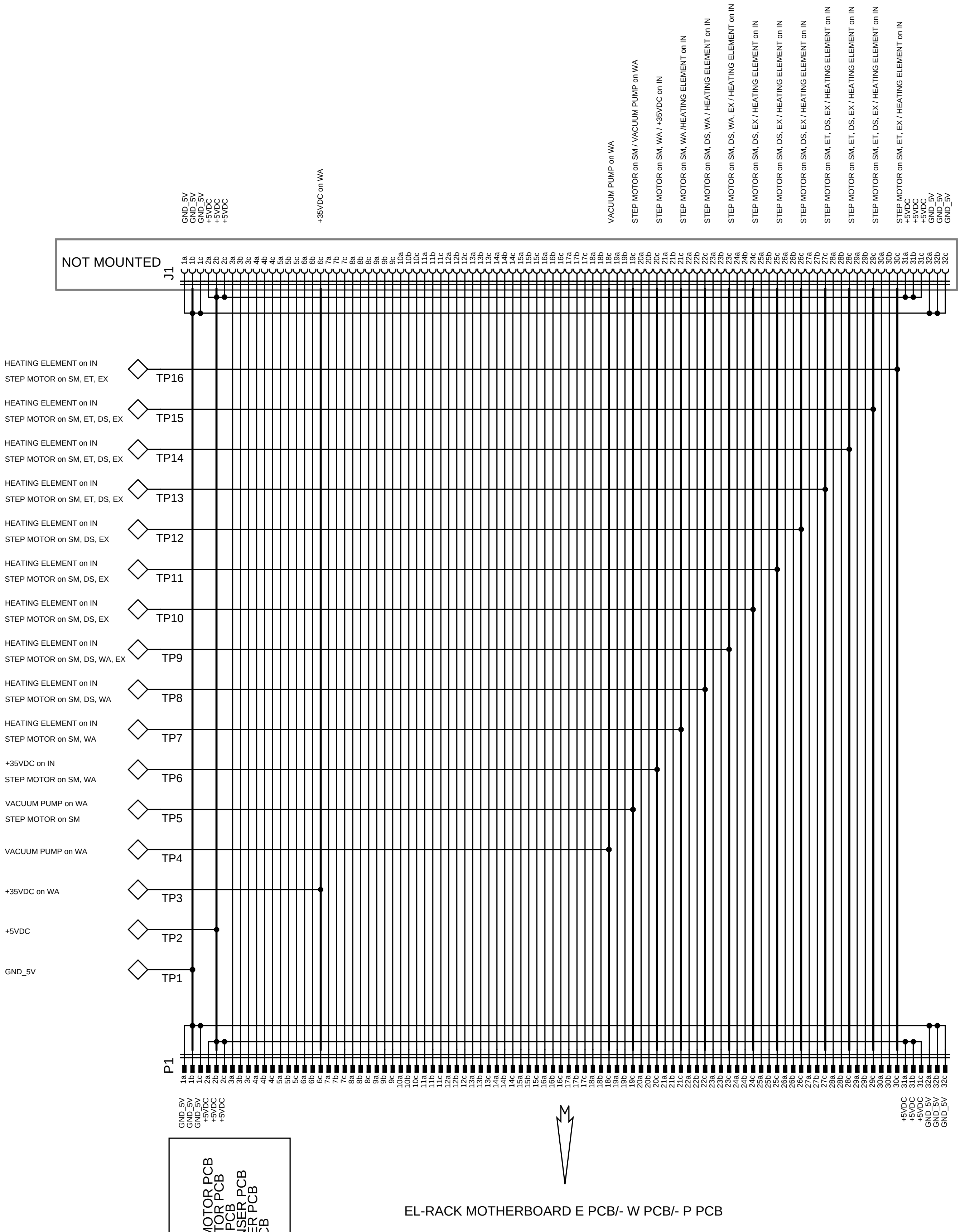
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
146405	IC27C256 PRO VEEPS11.ACH	00	107	1.000	A
235416	FARBFL. 7,5ML HELLBLAU HAM	00	108	1.000	T
235425	FARBFL. 7,5ML GRAUBLAU HAM	00	109	1.000	T
235418	HAERTERFLASCHE 7,5 ML	00	110	1.000	T
235417	FARBFL. 7,5ML DUNKELBLAU HAM	00	111	1.000	T
147581	JUSTIERSCHEIBE	00	112	2.000	A
369051	VERPACK CHIP CONTAINER TYP 2	00	114	1.000	
511057	OEL MICROGLISS D-5 20ML	00	115	1.000	T
146394	CABLE MODULE CONNECTION	00	116	2.000	T
146395	SERVICE PCB	00	117	1.000	T
239038	ELEKTRONIKKOFFER	00	118	2.000	
239039	EINLEGEPLATTE	00	119	8.000	
148245	SETSCREW	00	120	1.000	A
147516	WASH FLUID LEVEL SENSOR	00	121	1.000	A
361036	KABELHALTER	00	122	3.000	
361002	KABELBEF. 375 S	00	123	3.000	
361004	KABELBEF. CFCC-4 1/2”	00	124	3.000	
369038	VERRIEGELUNGSMUTTER	00	125	1.000	B
255038	KENNZEICHNUNG LABEL 21X9 WEISS	00	126	2.000	
148339	SUPPORT ENTRY MODULE	00	128	1.000	T
148355	TRANSP COVER MAGNET	00	129	1.000	T
146409	CONNECTORBOARD W6 PCB	00	130	1.000	A
622054	PACKING LIST ML FAME	05	131	1.000	
511069	MOLYKOTE FETTPASTE DX	00	132	1.000	T
146317	PROCESSOR 4 PCB	01	135	1.000	A
235426	FARBFL.7,5ML SIGNALSCHW.	00	136	1.000	T
235427	FARBFL.7,5ML ACHATGRAU	00	137	1.000	T

1.1.2.6.2 **Service PCB** (to be used with Diagnostic Master)

Component Layout 146.395 revision 00


TP16
TP13
TP10
TP7
TP4
TP1
TP15
TP12
TP9
TP6
TP2
TP14
TP11
TP8
TP5
TP3
P1
M
L
K
I
H
G
F
E
D
C
B
A

Service PCB Wiring Diagram 604.852 revision 00


GND_5V
GND_5V
GND_5V
+5VDC
+5VDC
+5VDC
+35VDC on WA
VACUUM PUMP on WA
STEP MOTOR on SM / VACUUM PUMP on WA
STEP MOTOR on SM, WA / +35VDC on IN
STEP MOTOR on SM, WA /HEATING ELEMENT on IN
STEP MOTOR on SM, DS, WA / HEATING ELEMENT on IN
STEP MOTOR on SM, DS, WA, EX / HEATING ELEMENT on IN
STEP MOTOR on SM, DS, EX / HEATING ELEMENT on IN
STEP MOTOR on SM, DS, EX / HEATING ELEMENT on IN
STEP MOTOR on SM, DS, EX / HEATING ELEMENT on IN
STEP MOTOR on SM, ET, DS, EX / HEATING ELEMENT on IN
STEP MOTOR on SM, ET, DS, EX / HEATING ELEMENT on IN
STEP MOTOR on SM, ET, DS, EX / HEATING ELEMENT on IN
STEP MOTOR on SM, ET, EX / HEATING ELEMENT on IN
+5VDC
+5VDC
+5VDC
GND_5V
GND_5V
GND_5V
NOT MOUNTED
J1
1a 1b 1c 2a 2b 2c 3a 3b 3c 4a 4b 4c 5a 5b 5c 6a 6b 6c 7a 7b 7c 8a 8b 8c 9a 9b 9c 10a 10b 10c 11a 11b 11c 12a 12b 12c 13a 13b 13c 14a 14b 14c 15a 15b 15c 16a 16b 16c 17a 17b 17c 18a 18b 18c 19a 19b 19c 20a 20b 20c 21a 21b 21c 22a 22b 22c 23a 23b 23c 24a 24b 24c 25a 25b 25c 26a 26b 26c 27a 27b 27c 28a 28b 28c 29a 29b 29c 30a 30b 30c 31a 31b 31c 32a 32b 32c
HEATING ELEMENT on IN
STEP MOTOR on SM, ET, EX
TP16
HEATING ELEMENT on IN
STEP MOTOR on SM, ET, DS, EX
TP15
HEATING ELEMENT on IN
STEP MOTOR on SM, ET, DS, EX
TP14
HEATING ELEMENT on IN
STEP MOTOR on SM, ET, DS, EX
TP13
HEATING ELEMENT on IN
STEP MOTOR on SM, DS, EX
TP12
HEATING ELEMENT on IN
STEP MOTOR on SM, DS, EX
TP11
HEATING ELEMENT on IN
STEP MOTOR on SM, DS, EX
TP10
HEATING ELEMENT on IN
STEP MOTOR on SM, DS, WA, EX
TP9
HEATING ELEMENT on IN
STEP MOTOR on SM, DS, WA
TP8
HEATING ELEMENT on IN
STEP MOTOR on SM, WA
TP7
+35VDC on IN
STEP MOTOR on SM, WA
TP6
VACUUM PUMP on WA
STEP MOTOR on SM
TP5
VACUUM PUMP on WA
TP4
+35VDC on WA
TP3
+5VDC
TP2
GND_5V
TP1
P1
1a 1b 1c 2a 2b 2c 3a 3b 3c 4a 4b 4c 5a 5b 5c 6a 6b 6c 7a 7b 7c 8a 8b 8c 9a 9b 9c 10a 10b 10c 11a 11b 11c 12a 12b 12c 13a 13b 13c 14a 14b 14c 15a 15b 15c 16a 16b 16c 17a 17b 17c 18a 18b 18c 19a 19b 19c 20a 20b 20c 21a 21b 21c 22a 22b 22c 23a 23b 23c 24a 24b 24c 25a 25b 25c 26a 26b 26c 27a 27b 27c 28a 28b 28c 29a 29b 29c 30a 30b 30c 31a 31b 31c 32a 32b 32c
GND_5V
GND_5V
GND_5V
+5VDC
+5VDC
+5VDC
+5VDC
+5VDC
+5VDC
GND_5V
GND_5V
GND_5V
EL-RACK MOTHERBOARD E PCB/- W PCB/- P PCB

LEGEND:
SM => STEP MOTOR PCB
IN => INCUBATOR PCB
ET => ENTRY PCB
DS => DISPENSER PCB
WA => WASHER PCB
EX => EXIT PCB

1.1.3 F.A.M.E. Description

Microlab F.A.M.E., a ***F***ully ***A***utomated ***M***icroplate ***E***LISA processor, carries out all necessary steps of a microplate ELISA after sample distribution with minimum user interference: plate incubation, plate washing, reagent dispensing and photometric evaluation.

With modular design of the different functions, the instrument can be adjusted to individual laboratory requirements. The standard configuration contains enough plate incubation and reagent capacity to ensure a throughput of approximately 10 microplates/hour with continuous loading capability. Bar codes on plates and reagents ensure positive identification throughout the process. Zero carry-over is achieved using disposable reagent containers and syringes.

The instrument is driven by a user-friendly software for definition, processing and interpretation of the vast majority of available ELISA tests.

- Modular, extendable design, can be adapted to the various laboratory needs.
- Modular design allows parallel processing of ELISA steps.
- Automation

  The standard configuration comprises enough plate incubation (20 slots) and reagent capacity (16 containers), to ensure high throughput.
- Walk-away

  Continuous processing: ML F.A.M.E. may be continuously loaded with micro titer plates (up to 4) which are processed as long as there is capacity available. A separate exit stack, where up to ten micro titer plates can be stacked, keeps the entry stack free for loading plates.
- Complete instrumentation

  Microlab F.A.M.E. ensures positive identification via barcodes on plates and reagents.

  No carry-over, using disposable syringes (for each reagent container a syringe).

  No carry-over with the intelligent cleaning procedure and the autorinse of wash system.
- Open System

  Microlab F.A.M.E. is able to process tests of various manufacturers simultaneously.

  Test kits can easily be adapted.

  Method library, kit lot library, reagents library, wash solutions library.

  Complete test evaluation (qualitative, quantitative, semi quantitative) and test reports.
- Communication and LAN Integration

Communication with sample preparation instruments, e.g. ML AT / ATplus 2. Barcode data of pipetted samples and pipetting information are linked to the patient results. Results and protocols can be sent via external communication systems to a HOST computer.

1.1.3.1 Purpose of the system

ML F.A.M.E. is an automated bench-top analyzer for immunological tests based on the ELISA (Enzyme Linked Immuno Sorbent Assay) test principle in a defined format, so-called micro titration plates (MTP). ML F.A.M.E. will carry out all necessary processing steps for an ELISA test, including data evaluation and interpretation; however, the primary sample preparation step (i.e. transferring the samples into the MTP wells) is not included in ML F.A.M.E. This step will be carried out with pipetting robots like the Hamilton Microlab AT, ATplus or the Microlab 2200.

An ELISA test usually includes several steps, thus the following features are included into ML F.A.M.E.:

- incubation of the MTP at a defined temperature for a defined time
- washing of the MTP, i.e. aspirating the liquid in the wells, filling it with wash fluid and emptying the wells
- dispensing of reagents into the MTP wells
- photometric measurement of the MTP wells
- validation and interpretation of the photometric data and creation of result documentation.

The analyzer is designed as a walk-away device i.e. minimum user interaction during processing is required. Walk-away means that the operator is occupied with other tasks, but is able to respond fast if necessary.

ML F.A.M.E. is controlled by a computer system running the OS/2 operating system. DB/2 is used for the storage of data. The computer is not a built-in device and the customer is expected to provide it at his/her cost. A list of compatible computer types will be provided by Hamilton.

1.1.3.2 General Operation Procedure

Test plates with serum, controls and standards pipetted into the wells either manually or by using a sample pipetting instrument, are loaded onto the entry position of ML F.A.M.E. Plates can be introduced either individually or in stacks of up to four MTPs. The barcoded plate is identified by the ML F.A.M.E. bar code reader (with manual identification also possible) and then processed according to the method to which the plate barcode has been assigned. After the last processing step, the MTP is automatically placed on the exit stack, which can hold up to 10 MTPs. Also, photometric data evaluation and test interpretation is started once the O.D. values have been read. If ML F.A.M.E. communicates with a sample pipetting device, the barcode files (i.e. the barcodes of the samples being pipetted into the wells of the MTP) are combined with the results of the patients and result protocols are either printed out or sent to external communication systems (HOST, LAN).

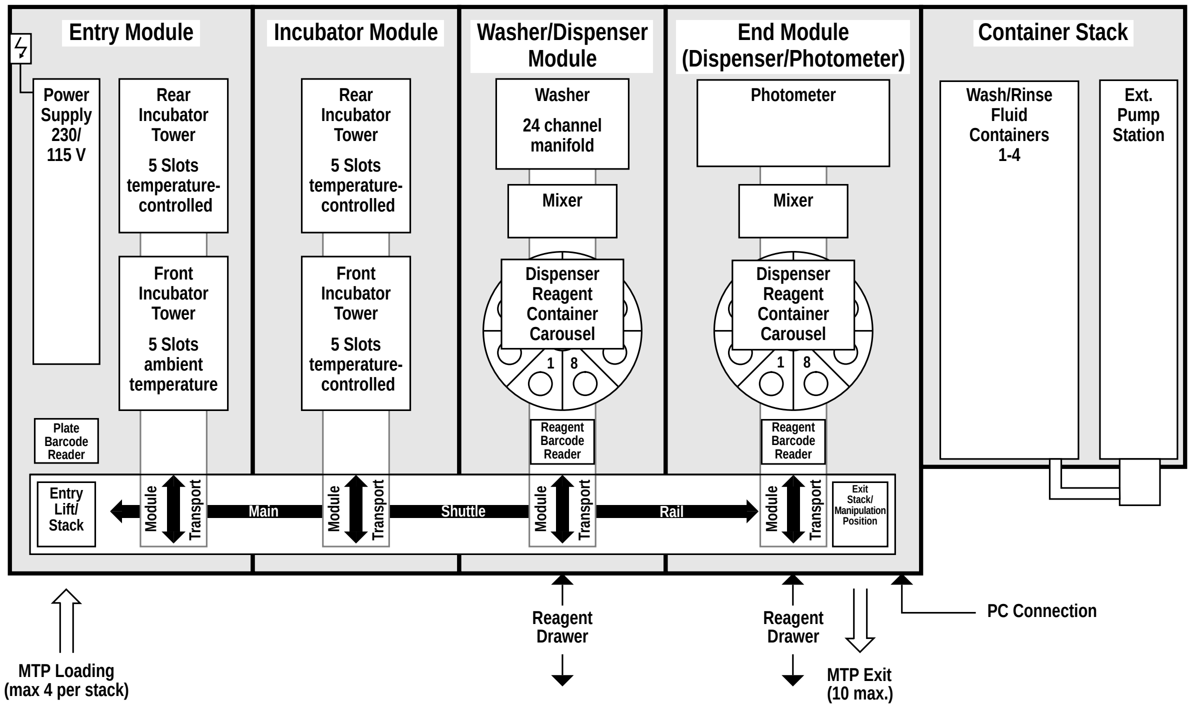
Plates requiring processing step(s) that cannot be carried out by ML F.A.M.E. can be sent to a manipulation platform for external processing. Such plates may be re-entered into ML F.A.M.E. if additional processing in ML F.A.M.E. is necessary.

1.1.3.3 F.A.M.E configurations

1.1.3.3.1 Overview

Refer to User Manual Chapter 2 for more details.

The modular setup of ML F.A.M.E. is shown in the figure below. The standard configuration includes four modules:


Entry Module
Incubator Module
Washer/Dispenser Module
End Module (Dispenser/Photometer)
Container Stack
Power Supply 230/ 115 V
Rear Incubator Tower 5 Slots temperature-controlled
Front Incubator Tower 5 Slots ambient temperature
Rear Incubator Tower 5 Slots temperature-controlled
Front Incubator Tower 5 Slots temperature-controlled
Washer 24 channel manifold
Mixer
Dispenser Reagent Container Carousel
1
8
Photometer
Mixer
Dispenser Reagent Container Carousel
1
8
Wash/Rinse Fluid Containers 1-4
Ext. Pump Station
Plate Barcode Reader
Reagent Barcode Reader
Reagent Barcode Reader
Entry Lift/ Stack
Module
Transport
Main
Module
Transport
Shuttle
Module
Transport
Rail
Module
Transport
Exit Stack/ Manipulation Position
MTP Loading (max 4 per stack)
Reagent Drawer
Reagent Drawer
MTP Exit (10 max.)
PC Connection

Schematic of ML F.A.M.E.

1. Entry Module

The main functions of the Entry Module are:

❒ Loading of the plates

❒ Plate barcode reading (positive plate identification)

❒ Incubation

2. Incubator Module

The Incubator Module contains two temperature controlled incubator towers each with 5 incubation slots. The temperature of both towers is programmable up to 70°C (maximum temperature difference between the two towers: 25°C). A plate can be loaded individually into each slot. The incubation time for each slot can also be defined individually.

3. Washer / Dispenser Module

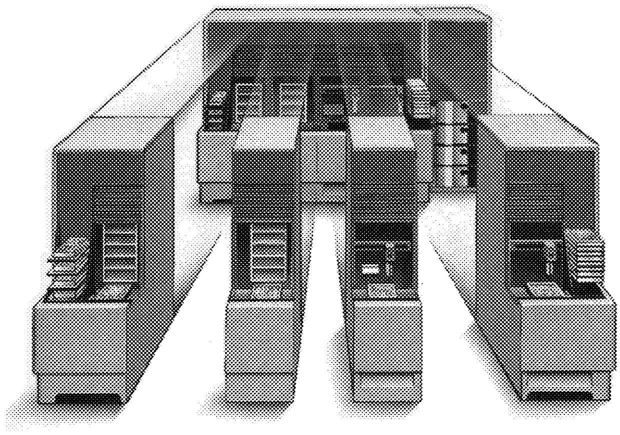
The Washer/Dispenser Module is used for plate washing and the dispensing of all necessary reagents for an ELISA test.

The Washer/Dispenser Module consists of the following components:

- ❐ **Washer:**
  The washer comprises a 24 channel manifold consisting of 3 rows of 8 needles. Each of the 24 wells is washed simultaneously. Three different wash solutions (up to 3 liters each) and one rinsing fluid (up to 3 liters) can be loaded into the container stack situated next to the End Module. All wash fluid containers are liquid level controlled.
- ❐ **Dispenser:**
  A single channel dispenser, using disposable syringes and reagent containers dispenses the required reagents into the plates. Carry-over is eliminated by the use of Hamilton reagent container systems with dedicated syringes for each reagent liquid. Each container is identified by a clear text label and a barcode.

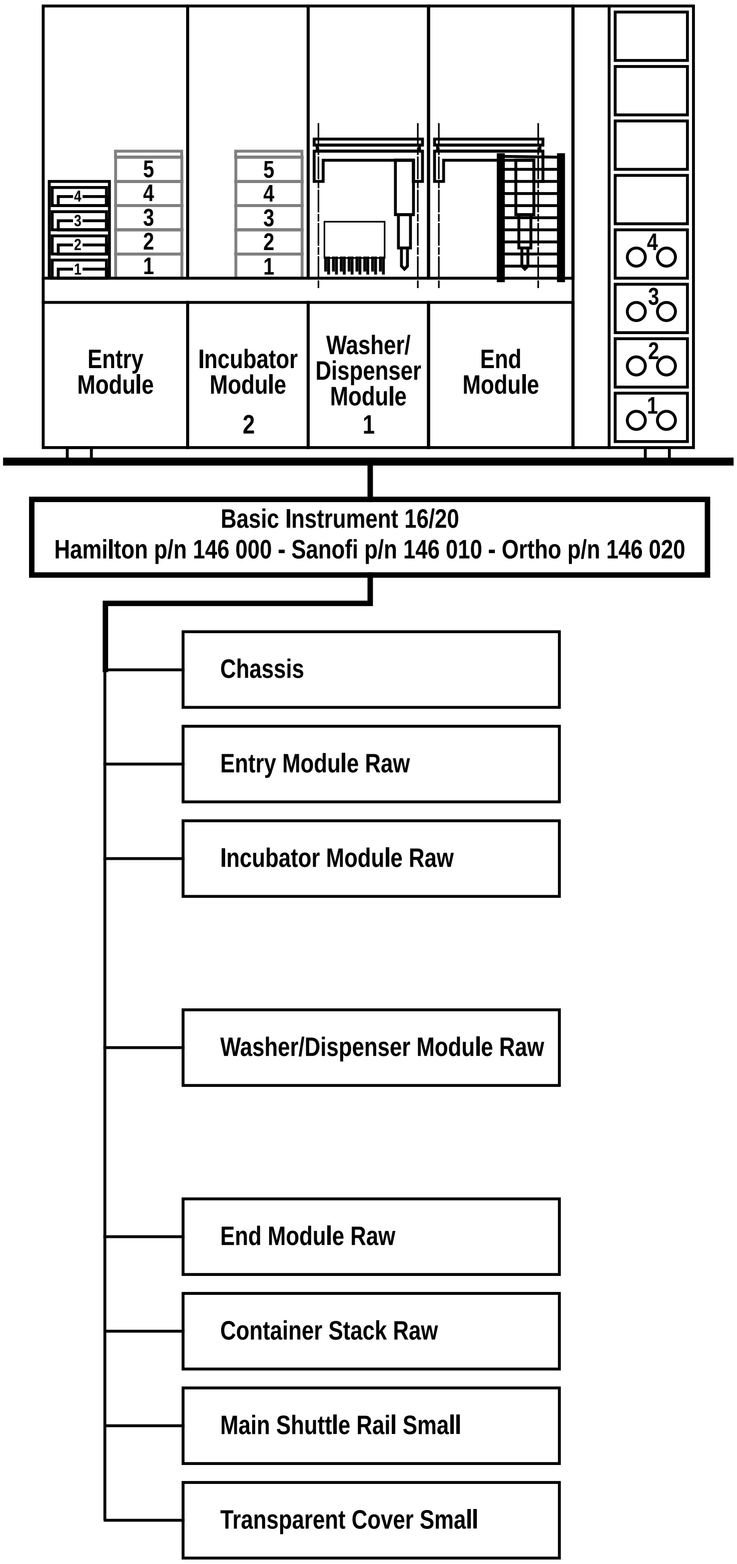
4. End Module

The End Module is used for reagent dispensing, photometric measurement and mixing (shaking of the plate). The Exit Stack and Manipulation Position are also located in this module allowing plates to be removed from the instrument.



Modular Design of the ML F.A.M.E

1.1.3.3.2 Configuration 16/20


4
3
2
1
5
4
3
2
1
5
4
3
2
1
4
3
2
1
Entry Module
Incubator Module
2
Washer/ Dispenser Module
1
End Module
Basic Instrument 16/20
Hamilton p/n 146 000 - Sanofi p/n 146 010 - Ortho p/n 146 020
Chassis
Entry Module Raw
Incubator Module Raw
Washer/Dispenser Module Raw
End Module Raw
Container Stack Raw
Main Shuttle Rail Small
Transparent Cover Small

Hamilton Microlab F.A.M.E. 16/20 - Part No. 146 000 REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147150	CHASSIS	00	1	1.000	C
147787	ENTRY MODULE RAW	01	2	1.000	B
147788	INKUBATOR MODULE RAW	01	3	1.000	B
147818	WASHER/DISP.MODULE RAW	01	4	1.000	B
147919	END MODULE RAW	02	5	1.000	B
147549	CONTAINER STACK RAW	00	6	1.000	C
147596	MAIN SHUTTLE RAIL SMALL	00	7	1.000	C
147920	TRANSPARENT COVER SMALL	00	8	1.000	C
147852	LOWER FRONT PANEL SMALL	00	10	1.000	C
147858	W/D DRAWER FRONT	00	11	1.000	C
147861	END MODULE DRAWER FRONT	00	12	1.000	C
147849	LEFT SIDE PANEL	00	13	1.000	C
147865	RIGHT SIDE COVER	00	14	1.000	C
147847	DOOR MANUAL BOX	00	15	1.000	C
147828	TOP COVER SMALL	00	16	1.000	C
147837	UPPER FRONT SMALL	00	17	1.000	C
147870	CONTAINER STACK TOP COVER	00	18	1.000	C
147873	STRIP CONTAINER STACK	00	19	1.000	C
147875	BOTTOM STRIP	00	20	1.000	C
147877	COVER WASH CONTAINER	00	21	1.000	C
147867	CONTAINER STACK DOOR	00	22	1.000	C
147923	BRACKET 1	00	25	2.000	
147924	BRACKET 2	00	26	2.000	
147925	BRACKET 3	00	27	1.000	
147926	DRAWER BRACKET	00	28	2.000	
147928	TOOLS SUPPORT	00	30	1.000	
147946	SCHARNIER	00	32	2.000	C
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	40	3.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	22.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	14.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	52	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	53	5.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	54	1.000	
409271	U-SCHEIBE M 4 DIN125A	00	57	9.000	
409410	U-SCHEIBE M 3 DIN125A	00	59	4.000	
144280	SICHERUNGSSCHEIBE	00	60	1.000	
147624	WASH FLUID CONTAINER	03	71	4.000	Z
281107	WASTE CONTAINER	00	72	2.000	Z
255517	TYPENSCHILD M1000+/M/OEM	00	85	1.000	
255044	LABEL VERPA MLFAME	01	86	1.000	
255043	LABEL SPANNUNGSKENNZEICHNUNG	00	87	1.000	
147496	SHIPMENT SAFETY BRACKET	00	90	1.000	Z
147768	EXIT-STACK COVER	00	101	1.000	C
400267	ZYL-SCHR.M 3X16 DIN912 A2	00	102	10.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	103	4.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	104	1.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	105	1.000	
255523	LABEL HUOSING PART MLFAME	00	106	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
255529	LABEL 3-WEGVERPACKUNG	00	108	1.000	
220145	PALLET SMALL	00	110	1.000	
220146	STACK COVERING SMALL	00	111	1.000	
220147	MODULES COVERING SMALL	00	112	1.000	
220148	PROTECTIVE INSERT SMALL	00	113	1.000	
220152	INSTRUMENT BOX SMALL	00	115	1.000	
220153	CARDBOARD TOP SMALL	00	116	1.000	
220154	HOUSING PANELS BOX SMALL	00	118	1.000	
608301	TECHN. STAND ML FAME	01	119	1.000	
608296	Q-BESCHEINIGUNG ML FAME	02	120	1.000	
220156	BAG	00	121	5.000	
146302	CABLE W60	00	130	1.000	Z
146373	SUBSTITUTE PLUG	00	131	1.000	Z
146385	CABLE P14	00	132	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	133	2.000	Z
147660	ENTRY STACK	00	134	1.000	Z
147670	HEIGHT MOVER TOOL	00	135	1.000	Z
147677	PLATEFORK	00	136	1.000	Z
148335	WASTE CAP	00	137	1.000	Z
147930	REAGENT CONTAINER SET	01	138	2.000	Z
147931	DISPOSABLE SYRINGE SET	01	139	2.000	V
147933	REAGENT BAR CODE LABEL SET	00	140	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	141	1.000	V
147935	MTP-TRANSPORTER	00	142	1.000	Z
147936	CLEANING SET MANIFOLD	00	143	1.000	Z
148163	CALIBRATION BOLT	00	144	1.000	T
148245	SETSCREW	00	145	2.000	A
220127	SHIPPING KIT PACKAGING	00	146	1.000	
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	147	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	148	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	149	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	150	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	151	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	152	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	153	1.000	Z
239021	R?CKSPIEGEL D= 24 L= 165	00	154	1.000	Z
255524	LABEL SHIPPING KIT MLFAME	01	155	1.000	
281093	MG VERSCHL.-BEUTEL 50x75	00	156	3.000	
369064	BATTERIE MN 2400 LR 03 1.5V	00	157	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	158	2.000	
409200	U-SCHEIBE M3 DIN9021B	00	159	4.000	
622023	PACKING LIST ML FAME	05	160	1.000	
148333	SPILLAGE TRAY	00	161	1.000	Z
148337	WASH FLUID CONT. STAND	00	162	1.000	Z
281153	STERIL-FILTER	00	163	1.000	V
148358	VENTING TUBING	00	164	1.000	V
255653	LABEL WARNING PC	00	165	2.000	
279403	MICRO WELL PLATTE	00	166	2.000	Z
255062	T?V GEPR?FTE SICHERHEIT GS	00	170	1.000	
147878	WASTE TUBING	00	180	1.000	Z

Sanofi Concerto 16/20 - Part No. 146 010 REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147150	CHASSIS	00	1	1.000	C
147787	ENTRY MODULE RAW	01	2	1.000	B
147788	INKUBATOR MODULE RAW	01	3	1.000	B
147818	WASHER/DISP.MODULE RAW	01	4	1.000	B
147919	END MODULE RAW	02	5	1.000	B
147549	CONTAINER STACK RAW	00	6	1.000	C
147596	MAIN SHUTTLE RAIL SMALL	00	7	1.000	C
148325	TRANSPARENT COVER SMALL SANOFI	00	8	1.000	C
148271	LOWER FRONT PANEL SMALL SANOFI	00	10	1.000	C
148273	W/D DRAWER FRONT SANOFI	00	11	1.000	C
148274	END MODULE DRAWER FRONT SANOFI	00	12	1.000	C
148270	LEFT SIDE PANEL SANOFI	00	13	1.000	C
148275	RIGHT SIDE COVER SANOFI	00	14	1.000	C
148269	DOOR MANUAL BOX SANOFI	00	15	1.000	C
148263	TOP COVER SMALL SANOFI	00	16	1.000	C
148266	UPPER FRONT SMALL SANOFI	00	17	1.000	C
148277	CONTAINER STACK TOP COVER SAN.	00	18	1.000	C
148278	STRIP CONTAINER STACK SANOFI	00	19	1.000	C
148279	BOTTOM STRIP SANOFI	00	20	1.000	C
148280	COVER WASH CONTAINER SANOFI	00	21	1.000	C
148276	CONTAINER STACK DOOR SANOFI	00	22	1.000	C
147923	BRACKET 1	00	25	2.000	
147924	BRACKET 2	00	26	2.000	
147925	BRACKET 3	00	27	1.000	
147926	DRAWER BRACKET	00	28	2.000	
147928	TOOLS SUPPORT	00	30	1.000	
147946	SCHARNIER	00	32	2.000	C
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	40	3.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	22.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	14.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	52	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	53	5.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	54	1.000	
409271	U-SCHEIBE M 4 DIN125A	00	57	9.000	
409410	U-SCHEIBE M 3 DIN125A	00	59	4.000	
144280	SICHERUNGSSCHEIBE	00	60	1.000	
147624	WASH FLUID CONTAINER	03	71	4.000	Z
281107	WASTE CONTAINER	00	72	2.000	Z
255517	TYPENSCHILD M1000+/M/OEM	00	85	1.000	
255635	LABEL VERPACKUNG CONCERTO	00	86	1.000	
255043	LABEL SPANNUNGSKENNZEICHNUNG	00	87	1.000	
147496	SHIPMENT SAFETY BRACKET	00	90	1.000	Z
147768	EXIT-STACK COVER	00	101	1.000	C
400267	ZYL-SCHR.M 3X16 DIN912 A2	00	102	10.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	103	4.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	104	1.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	105	1.000	
255637	LABEL HOUSING PARTS CON.	00	106	1.000	

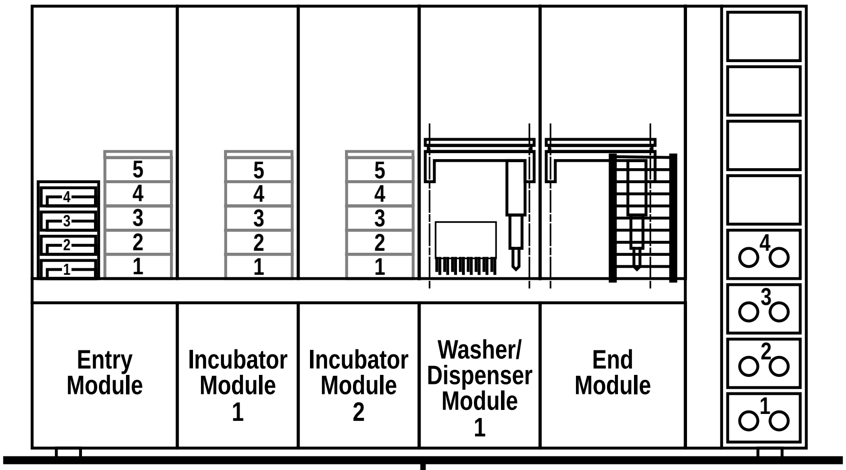
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
255529	LABEL 3-WEGVERPACKUNG	00	108	1.000	
220145	PALLET SMALL	00	110	1.000	
220146	STACK COVERING SMALL	00	111	1.000	
220147	MODULES COVERING SMALL	00	112	1.000	
220148	PROTECTIVE INSERT SMALL	00	113	1.000	
220152	INSTRUMENT BOX SMALL	00	115	1.000	
220153	CARDBOARD TOP SMALL	00	116	1.000	
220154	HOUSING PANELS BOX SMALL	00	118	1.000	
608301	TECHN. STAND ML FAME	01	119	1.000	
608296	Q-BESCHEINIGUNG ML FAME	02	120	1.000	
220156	BAG	00	121	5.000	
146302	CABLE W60	00	130	1.000	Z
146373	SUBSTITUTE PLUG	00	131	1.000	Z
146385	CABLE P14	00	132	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	133	2.000	Z
148323	ENTRY STACK SANOFI	00	134	1.000	Z
147670	HEIGHT MOVER TOOL	00	135	1.000	Z
147677	PLATEFORK	00	136	1.000	Z
148335	WASTE CAP	00	137	1.000	Z
147930	REAGENT CONTAINER SET	01	138	2.000	Z
147931	DISPOSABLE SYRINGE SET	01	139	2.000	V
147933	REAGENT BAR CODE LABEL SET	00	140	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	141	1.000	V
147935	MTP-TRANSPORTER	00	142	1.000	Z
147936	CLEANING SET MANIFOLD	00	143	1.000	Z
148163	CALIBRATION BOLT	00	144	1.000	T
148245	SETSCREW	00	145	2.000	A
220127	SHIPPING KIT PACKAGING	00	146	1.000	
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	147	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	148	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	149	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	150	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	151	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	152	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	153	1.000	Z
239021	R?CKSPIEGEL D= 24 L= 165	00	154	1.000	Z
255636	LABEL SHIP-KIT CONCERTO	00	155	1.000	
281093	MG VERSCHL.-BEUTEL 50x75	00	156	3.000	
369064	BATTERIE MN 2400 LR 03 1.5V	00	157	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	158	2.000	
622024	PACKING LIST CONCERTO	04	160	1.000	
148333	SPILLAGE TRAY	00	161	1.000	Z
148337	WASH FLUID CONT. STAND	00	162	1.000	Z
281153	STERIL-FILTER	00	163	1.000	V
148358	VENTING TUBING	00	164	1.000	V
255653	LABEL WARNING PC	00	165	2.000	
279403	MICRO WELL PLATTE	00	166	2.000	Z
255062	T?V GEPR?FTE SICHERHEIT GS	00	170	1.000	
147878	WASTE TUBING	00	180	1.000	Z

Ortho Summit Processor 16/20 - Part No. 146 020 REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147150	CHASSIS	00	1	1.000	C
147787	ENTRY MODULE RAW	01	2	1.000	B
147788	INKUBATOR MODULE RAW	01	3	1.000	B
147818	WASHER/DISP.MODULE RAW	01	4	1.000	B
147919	END MODULE RAW	02	5	1.000	B
147549	CONTAINER STACK RAW	00	6	1.000	C
147596	MAIN SHUTTLE RAIL SMALL	00	7	1.000	C
147920	TRANSPARENT COVER SMALL	00	8	1.000	C
148290	LOWER FRONT PANEL SMALL ORTHO	00	10	1.000	C
148292	W/D DRAWER FRONT ORTHO	00	11	1.000	C
148293	END MODULE DRAWER FRONT ORTHO	00	12	1.000	C
148289	LEFT SIDE PANEL ORTHO	00	13	1.000	C
148294	RIGHT SIDE COVER ORTHO	00	14	1.000	C
148288	DOOR MANUAL BOX ORTHO	00	15	1.000	C
148281	TOP COVER SMALL ORTHO	00	16	1.000	C
148285	UPPER FRONT SMALL ORTHO	00	17	1.000	C
148296	CONTAINER STACK TOP COVER ORT.	00	18	1.000	C
148297	STRIP CONTAINER STACK ORTHO	00	19	1.000	C
148298	BOTTOM STRIP ORTHO	00	20	1.000	C
148299	COVER WASH CONTAINER ORTHO	00	21	1.000	C
148295	CONTAINER STACK DOOR ORTHO	00	22	1.000	C
147923	BRACKET 1	00	25	2.000	
147924	BRACKET 2	00	26	2.000	
147925	BRACKET 3	00	27	1.000	
147926	DRAWER BRACKET	00	28	2.000	
147928	TOOLS SUPPORT	00	30	1.000	
147946	SCHARNIER	00	32	2.000	C
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	40	3.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	22.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	14.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	52	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	53	5.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	54	1.000	
409271	U-SCHEIBE M 4 DIN125A	00	57	9.000	
409410	U-SCHEIBE M 3 DIN125A	00	59	4.000	
144280	SICHERUNGSSCHEIBE	00	60	1.000	
147624	WASH FLUID CONTAINER	03	71	4.000	Z
281107	WASTE CONTAINER	00	72	2.000	Z
255517	TYPENSCHILD M1000+/M/OEM	00	85	1.000	
255044	LABEL VERPA MLFAME	01	86	1.000	
255043	LABEL SPANNUNGSKENNZEICHNUNG	00	87	1.000	
147496	SHIPMENT SAFETY BRACKET	00	90	1.000	Z
147768	EXIT-STACK COVER	00	101	1.000	C
400267	ZYL-SCHR.M 3X16 DIN912 A2	00	102	10.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	103	4.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	104	1.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	105	1.000	
255523	LABEL HUOSING PART MLFAME	00	106	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
255529	LABEL 3-WEGVERPACKUNG	00	108	1.000	
220145	PALLET SMALL	00	110	1.000	
220146	STACK COVERING SMALL	00	111	1.000	
220147	MODULES COVERING SMALL	00	112	1.000	
220148	PROTECTIVE INSERT SMALL	00	113	1.000	
220152	INSTRUMENT BOX SMALL	00	115	1.000	
220153	CARDBOARD TOP SMALL	00	116	1.000	
220154	HOUSING PANELS BOX SMALL	00	118	1.000	
608301	TECHN. STAND ML FAME	01	119	1.000	
608296	Q-BESCHEINIGUNG ML FAME	02	120	1.000	
220156	BAG	00	121	5.000	
146302	CABLE W60	00	130	1.000	Z
146373	SUBSTITUTE PLUG	00	131	1.000	Z
146385	CABLE P14	00	132	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	133	2.000	Z
147660	ENTRY STACK	00	134	1.000	Z
147670	HEIGHT MOVER TOOL	00	135	1.000	Z
147677	PLATEFORK	00	136	1.000	Z
148335	WASTE CAP	00	137	1.000	Z
147930	REAGENT CONTAINER SET	01	138	2.000	Z
147931	DISPOSABLE SYRINGE SET	01	139	2.000	V
147933	REAGENT BAR CODE LABEL SET	00	140	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	141	1.000	V
147935	MTP-TRANSPORTER	00	142	1.000	Z
147936	CLEANING SET MANIFOLD	00	143	1.000	Z
148163	CALIBRATION BOLT	00	144	1.000	T
148245	SETSCREW	00	145	2.000	A
220127	SHIPPING KIT PACKAGING	00	146	1.000	
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	147	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	148	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	149	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	150	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	151	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	152	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	153	1.000	Z
239021	R?CKSPIEGEL D= 24 L= 165	00	154	1.000	Z
255524	LABEL SHIPPING KIT MLFAME	01	155	1.000	
281093	MG VERSCHL.-BEUTEL 50x75	00	156	3.000	
369064	BATTERIE MN 2400 LR 03 1.5V	00	157	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	158	2.000	
622025	PACKING LIST ORTHO	05	160	1.000	
148333	SPILLAGE TRAY	00	161	1.000	Z
148337	WASH FLUID CONT. STAND	00	162	1.000	Z
281153	STERIL-FILTER	00	163	1.000	V
148358	VENTING TUBING	00	164	1.000	V
255653	LABEL WARNING PC	00	165	2.000	
279403	MICRO WELL PLATTE	00	166	2.000	Z
255062	T?V GEPR?FTE SICHERHEIT GS	00	170	1.000	
147878	WASTE TUBING	00	180	1.000	Z

1.1.3.3.3 Configuration 16/30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Entry Module
Incubator Module 1
Incubator Module 2
Washer/ Dispenser Module 1
End Module

Basic Instrument 16/30
Hamilton p/n 146 001 - Sanofi p/n 146 011 - Ortho p/n 146 021

- **Chassis**
- **Entry Module Raw**
- **Incubator Module Raw**
- **Incubator Module Raw**
- **Washer/Dispenser Module Raw**
- **End Module Raw**
- **Container Stack Raw**
- **Main Shuttle Rail Medium**
- **Transparent Cover Medium**

Microlab F.A.M.E. - Part No. 146 001 REV:00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147150	CHASSIS	00	1	1.000	C
147787	ENTRY MODULE RAW	01	2	1.000	B
147788	INKUBATOR MODULE RAW	01	3	2.000	B
147818	WASHER/DISP.MODULE RAW	01	4	1.000	B
147919	END MODULE RAW	02	5	1.000	B
147549	CONTAINER STACK RAW	00	6	1.000	C
147601	MAIN SHUTTLE RAIL MEDIUM	00	7	1.000	C
147921	TRANSPARENT COVER MEDIUM	00	8	1.000	C
147855	LOWER FRONT PANEL LARGE	00	10	1.000	C
147858	W/D DRAWER FRONT	00	11	1.000	C
147861	END MODULE DRAWER FRONT	00	12	1.000	C
147849	LEFT SIDE PANEL	00	13	1.000	C
147865	RIGHT SIDE COVER	00	14	1.000	C
147847	DOOR MANUAL BOX	00	15	1.000	C
147831	TOP COVER MEDIUM	00	16	1.000	C
147840	UPPER FRONT MEDIUM	00	17	1.000	C
147870	CONTAINER STACK TOP COVER	00	18	1.000	C
147873	STRIP CONTAINER STACK	00	19	1.000	C
147875	BOTTOM STRIP	00	20	1.000	C
147877	COVER WASH CONTAINER	00	21	1.000	C
147867	CONTAINER STACK DOOR	00	22	1.000	C
147923	BRACKET 1	00	25	2.000	
147924	BRACKET 2	00	26	2.000	
147925	BRACKET 3	00	27	3.000	
147926	DRAWER BRACKET	00	28	2.000	
147928	TOOLS SUPPORT	00	30	1.000	
147946	SCHARNIER	00	32	2.000	C
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	40	3.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	26.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	14.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	52	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	53	5.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	54	1.000	
409271	U-SCHEIBE M 4 DIN125A	00	57	9.000	
409410	U-SCHEIBE M 3 DIN125A	00	59	4.000	
144280	SICHERUNGSSCHEIBE	00	60	1.000	
147624	WASH FLUID CONTAINER	03	71	4.000	Z
281107	WASTE CONTAINER	00	72	2.000	Z
255517	TYPENSCHILD M1000+/M/OEM	00	85	1.000	
255044	LABEL VERPA MLFAME	01	86	1.000	
255043	LABEL SPANNUNGSKENNZEICHNUNG	00	87	1.000	
147496	SHIPMENT SAFETY BRACKET	00	90	1.000	Z
147768	EXIT-STACK COVER	00	101	1.000	C
400267	ZYL-SCHR.M 3X16 DIN912 A2	00	102	10.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	103	4.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	104	1.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	105	1.000	
255523	LABEL HUOSING PART MLFAME	00	106	1.000	
255529	LABEL 3-WEGVERPACKUNG	00	108	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
220123	PALLET LARGE	00	110	1.000	
220131	STACK COVERING LARGE	00	111	1.000	
220132	MODULES COVERING LARGE	00	112	1.000	
220133	PROTECTIVE INSERT 1 LARGE	00	113	1.000	
220134	PROTECTIVE INSERT 2 LARGE	00	114	1.000	
220135	INSTRUMENT BOX LARGE	00	115	1.000	
220136	CARDBOARD TOP LARGE	00	116	1.000	
220143	HOUSING PANELS BOX LARGE	00	118	1.000	
608301	TECHN. STAND ML FAME	01	119	1.000	
608296	Q-BESCHEINIGUNG ML FAME	02	120	1.000	
220156	BAG	00	121	6.000	
146302	CABLE W60	00	130	1.000	Z
146373	SUBSTITUTE PLUG	00	131	1.000	Z
146385	CABLE P14	00	132	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	133	2.000	Z
147660	ENTRY STACK	00	134	1.000	Z
147670	HEIGHT MOVER TOOL	00	135	1.000	Z
147677	PLATEFORK	00	136	1.000	Z
148335	WASTE CAP	00	137	1.000	Z
147930	REAGENT CONTAINER SET	01	138	2.000	Z
147931	DISPOSABLE SYRINGE SET	01	139	2.000	V
147933	REAGENT BAR CODE LABEL SET	00	140	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	141	1.000	V
147935	MTP-TRANSPORTER	00	142	1.000	Z
147936	CLEANING SET MANIFOLD	00	143	1.000	Z
148163	CALIBRATION BOLT	00	144	1.000	T
148245	SETSCREW	00	145	2.000	A
220127	SHIPPING KIT PACKAGING	00	146	1.000	
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	147	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	148	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	149	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	150	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	151	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	152	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	153	1.000	Z
239021	R?CKSPIEGEL D= 24 L= 165	00	154	1.000	Z
255524	LABEL SHIPPING KIT MLFAME	01	155	1.000	
281093	MG VERSCHL.-BEUTEL 50x75	00	156	3.000	
369064	BATTERIE MN 2400 LR 03 1.5V	00	157	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	158	2.000	
409200	U-SCHEIBE M3 DIN9021B	00	159	4.000	
622023	PACKING LIST ML FAME	05	160	1.000	
148333	SPILLAGE TRAY	00	161	1.000	Z
148337	WASH FLUID CONT. STAND	00	162	1.000	Z
281153	STERIL-FILTER	00	163	1.000	V
148358	VENTING TUBING	00	164	1.000	V
255653	LABEL WARNING PC	00	165	2.000	
279403	MICRO WELL PLATTE	00	166	2.000	Z
255062	T?V GEPR?FTE SICHERHEIT GS	00	170	1.000	
147878	WASTE TUBING	00	180	1.000	Z

Sanofi Concerto 16/30 - Part No. 146 011 REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147150	CHASSIS	00	1	1.000	C
147787	ENTRY MODULE RAW	01	2	1.000	B
147788	INKUBATOR MODULE RAW	01	3	2.000	B
147818	WASHER/DISP.MODULE RAW	01	4	1.000	B
147919	END MODULE RAW	02	5	1.000	B
147549	CONTAINER STACK RAW	00	6	1.000	C
147601	MAIN SHUTTLE RAIL MEDIUM	00	7	1.000	C
148326	TRANSPARENT COVER MEDIUM SAN.	00	8	1.000	C
148272	LOWER FRONT PANEL LARGE SANOFI	00	10	1.000	C
148273	W/D DRAWER FRONT SANOFI	00	11	1.000	C
148274	END MODULE DRAWER FRONT SANOFI	00	12	1.000	C
148270	LEFT SIDE PANEL SANOFI	00	13	1.000	C
148275	RIGHT SIDE COVER SANOFI	00	14	1.000	C
148269	DOOR MANUAL BOX SANOFI	00	15	1.000	C
148264	TOP COVER MEDIUM SANOFI	00	16	1.000	C
148267	UPPER FRONT MEDIUM SANOFI	00	17	1.000	C
148277	CONTAINER STACK TOP COVER SAN.	00	18	1.000	C
148278	STRIP CONTAINER STACK SANOFI	00	19	1.000	C
148279	BOTTOM STRIP SANOFI	00	20	1.000	C
148280	COVER WASH CONTAINER SANOFI	00	21	1.000	C
148276	CONTAINER STACK DOOR SANOFI	00	22	1.000	C
147923	BRACKET 1	00	25	2.000	
147924	BRACKET 2	00	26	2.000	
147925	BRACKET 3	00	27	3.000	
147926	DRAWER BRACKET	00	28	2.000	
147928	TOOLS SUPPORT	00	30	1.000	
147946	SCHARNIER	00	32	2.000	C
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	40	3.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	26.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	14.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	52	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	53	5.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	54	1.000	
409271	U-SCHEIBE M 4 DIN125A	00	57	9.000	
409410	U-SCHEIBE M 3 DIN125A	00	59	4.000	
144280	SICHERUNGSSCHEIBE	00	60	1.000	
147624	WASH FLUID CONTAINER	03	71	4.000	Z
281107	WASTE CONTAINER	00	72	2.000	Z
255517	TYPENSCHILD M1000+/M/OEM	00	85	1.000	
255635	LABEL VERPACKUNG CONCERTO	00	86	1.000	
255043	LABEL SPANNUNGSKENNZEICHNUNG	00	87	1.000	
147496	SHIPMENT SAFETY BRACKET	00	90	1.000	Z
147768	EXIT-STACK COVER	00	101	1.000	C
400267	ZYL-SCHR.M 3X16 DIN912 A2	00	102	10.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	103	4.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	104	1.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	105	1.000	
255637	LABEL HOUSING PARTS CON.	00	106	1.000	

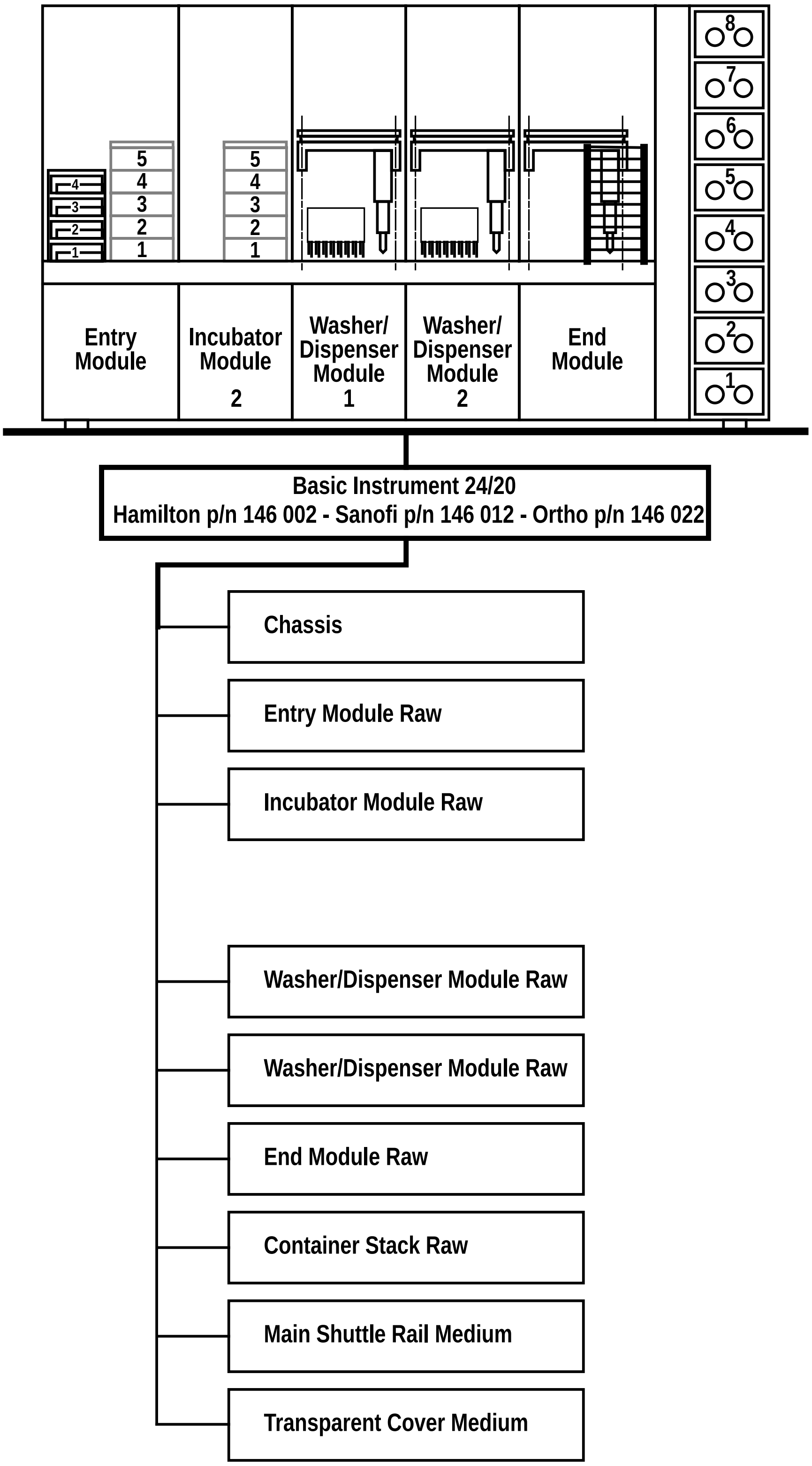
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
255529	LABEL 3-WEGVERPACKUNG	00	108	1.000	
220123	PALLET LARGE	00	110	1.000	
220131	STACK COVERING LARGE	00	111	1.000	
220132	MODULES COVERING LARGE	00	112	1.000	
220133	PROTECTIVE INSERT 1 LARGE	00	113	1.000	
220134	PROTECTIVE INSERT 2 LARGE	00	114	1.000	
220135	INSTRUMENT BOX LARGE	00	115	1.000	
220136	CARDBOARD TOP LARGE	00	116	1.000	
220143	HOUSING PANELS BOX LARGE	00	118	1.000	
608301	TECHN. STAND ML FAME	01	119	1.000	
608296	Q-BESCHEINIGUNG ML FAME	02	120	1.000	
220156	BAG	00	121	6.000	
146302	CABLE W60	00	130	1.000	Z
146373	SUBSTITUTE PLUG	00	131	1.000	Z
146385	CABLE P14	00	132	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	133	2.000	Z
148323	ENTRY STACK SANOFI	00	134	1.000	Z
147670	HEIGHT MOVER TOOL	00	135	1.000	Z
147677	PLATEFORK	00	136	1.000	Z
148335	WASTE CAP	00	137	1.000	Z
147930	REAGENT CONTAINER SET	01	138	2.000	Z
147931	DISPOSABLE SYRINGE SET	01	139	2.000	V
147933	REAGENT BAR CODE LABEL SET	00	140	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	141	1.000	V
147935	MTP-TRANSPORTER	00	142	1.000	Z
147936	CLEANING SET MANIFOLD	00	143	1.000	Z
148163	CALIBRATION BOLT	00	144	1.000	T
148245	SETSCREW	00	145	2.000	A
220127	SHIPPING KIT PACKAGING	00	146	1.000	
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	147	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	148	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	149	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	150	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	151	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	152	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	153	1.000	Z
239021	R?CKSPIEGEL D= 24 L= 165	00	154	1.000	Z
255636	LABEL SHIP-KIT CONCERTO	00	155	1.000	
281093	MG VERSCHL.-BEUTEL 50x75	00	156	3.000	
369064	BATTERIE MN 2400 LR 03 1.5V	00	157	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	158	2.000	
622024	PACKING LIST CONCERTO	04	160	1.000	
148333	SPILLAGE TRAY	00	161	1.000	Z
148337	WASH FLUID CONT. STAND	00	162	1.000	Z
281153	STERIL-FILTER	00	163	1.000	V
148358	VENTING TUBING	00	164	1.000	V
255653	LABEL WARNING PC	00	165	2.000	
279403	MICRO WELL PLATTE	00	166	2.000	Z
255062	T?V GEPR?FTE SICHERHEIT GS	00	170	1.000	
147878	WASTE TUBING	00	180	1.000	Z

Ortho Summit Processor 16/30 - Part No. 146 021 REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147150	CHASSIS	00	1	1.000	C
147787	ENTRY MODULE RAW	01	2	1.000	B
147788	INKUBATOR MODULE RAW	01	3	2.000	B
147818	WASHER/DISP.MODULE RAW	01	4	1.000	B
147919	END MODULE RAW	02	5	1.000	B
147549	CONTAINER STACK RAW	00	6	1.000	C
147601	MAIN SHUTTLE RAIL MEDIUM	00	7	1.000	C
147921	TRANSPARENT COVER MEDIUM	00	8	1.000	C
148291	LOWER FRONT PANEL LARGE ORTHO	00	10	1.000	C
148292	W/D DRAWER FRONT ORTHO	00	11	1.000	C
148293	END MODULE DRAWER FRONT ORTHO	00	12	1.000	C
148289	LEFT SIDE PANEL ORTHO	00	13	1.000	C
148294	RIGHT SIDE COVER ORTHO	00	14	1.000	C
148288	DOOR MANUAL BOX ORTHO	00	15	1.000	C
148282	TOP COVER MEDIUM ORTHO	00	16	1.000	C
148286	UPPER FRONT MEDIUM ORTHO	00	17	1.000	C
148296	CONTAINER STACK TOP COVER ORT.	00	18	1.000	C
148297	STRIP CONTAINER STACK ORTHO	00	19	1.000	C
148298	BOTTOM STRIP ORTHO	00	20	1.000	C
148299	COVER WASH CONTAINER ORTHO	00	21	1.000	C
148295	CONTAINER STACK DOOR ORTHO	00	22	1.000	C
147923	BRACKET 1	00	25	2.000	
147924	BRACKET 2	00	26	2.000	
147925	BRACKET 3	00	27	3.000	
147926	DRAWER BRACKET	00	28	2.000	
147928	TOOLS SUPPORT	00	30	1.000	
147946	SCHARNIER	00	32	2.000	C
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	40	3.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	26.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	14.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	52	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	53	5.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	54	1.000	
409271	U-SCHEIBE M 4 DIN125A	00	57	9.000	
409410	U-SCHEIBE M 3 DIN125A	00	59	4.000	
144280	SICHERUNGSSCHEIBE	00	60	1.000	
147624	WASH FLUID CONTAINER	03	71	4.000	Z
281107	WASTE CONTAINER	00	72	2.000	Z
255517	TYPENSCHILD M1000+/M/OEM	00	85	1.000	
255520	LABEL VERPA MLFAME 16/30	00	86	1.000	
255043	LABEL SPANNUNGSKENNZEICHNUNG	00	87	1.000	
147496	SHIPMENT SAFETY BRACKET	00	90	1.000	Z
147768	EXIT-STACK COVER	00	101	1.000	C
400267	ZYL-SCHR.M 3X16 DIN912 A2	00	102	10.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	103	4.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	104	1.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	105	1.000	
255523	LABEL HUOSING PART MLFAME	00	106	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
255529	LABEL 3-WEGVERPACKUNG	00	108	1.000	
220123	PALLET LARGE	00	110	1.000	
220131	STACK COVERING LARGE	00	111	1.000	
220132	MODULES COVERING LARGE	00	112	1.000	
220133	PROTECTIVE INSERT 1 LARGE	00	113	1.000	
220134	PROTECTIVE INSERT 2 LARGE	00	114	1.000	
220135	INSTRUMENT BOX LARGE	00	115	1.000	
220136	CARDBOARD TOP LARGE	00	116	1.000	
220143	HOUSING PANELS BOX LARGE	00	118	1.000	
608301	TECHN. STAND ML FAME	01	119	1.000	
608296	Q-BESCHEINIGUNG ML FAME	02	120	1.000	
220156	BAG	00	121	6.000	
146302	CABLE W60	00	130	1.000	Z
146373	SUBSTITUTE PLUG	00	131	1.000	Z
146385	CABLE P14	00	132	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	133	2.000	Z
147660	ENTRY STACK	00	134	1.000	Z
147670	HEIGHT MOVER TOOL	00	135	1.000	Z
147677	PLATEFORK	00	136	1.000	Z
148335	WASTE CAP	00	137	1.000	Z
147930	REAGENT CONTAINER SET	01	138	2.000	Z
147931	DISPOSABLE SYRINGE SET	01	139	2.000	V
147933	REAGENT BAR CODE LABEL SET	00	140	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	141	1.000	V
147935	MTP-TRANSPORTER	00	142	1.000	Z
147936	CLEANING SET MANIFOLD	00	143	1.000	Z
148163	CALIBRATION BOLT	00	144	1.000	T
148245	SETSCREW	00	145	2.000	A
220127	SHIPPING KIT PACKAGING	00	146	1.000	
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	147	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	148	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	149	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	150	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	151	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	152	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	153	1.000	Z
239021	R?CKSPIEGEL D= 24 L= 165	00	154	1.000	Z
255524	LABEL SHIPPING KIT MLFAME	01	155	1.000	
281093	MG VERSCHL.-BEUTEL 50x75	00	156	3.000	
369064	BATTERIE MN 2400 LR 03 1.5V	00	157	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	158	2.000	
622025	PACKING LIST ORTHO	05	160	1.000	
148333	SPILLAGE TRAY	00	161	1.000	Z
148337	WASH FLUID CONT. STAND	00	162	1.000	Z
281153	STERIL-FILTER	00	163	1.000	V
148358	VENTING TUBING	00	164	1.000	V
255653	LABEL WARNING PC	00	165	2.000	
279403	MICRO WELL PLATTE	00	166	2.000	Z
255062	T?V GEPR?FTE SICHERHEIT GS	00	170	1.000	
147878	WASTE TUBING	00	180	1.000	Z

1.1.3.3.4 Configuration 24/20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Entry Module
Incubator Module 2
Washer/ Dispenser Module 1
Washer/ Dispenser Module 2
End Module
Basic Instrument 24/20
Hamilton p/n 146 002 - Sanofi p/n 146 012 - Ortho p/n 146 022
Chassis
Entry Module Raw
Incubator Module Raw
Washer/Dispenser Module Raw
Washer/Dispenser Module Raw
End Module Raw
Container Stack Raw
Main Shuttle Rail Medium
Transparent Cover Medium

Microlab F.A.M.E. 24/20 - Part No. 146 002 REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147150	CHASSIS	00	1	1.000	C
147787	ENTRY MODULE RAW	01	2	1.000	B
147788	INKUBATOR MODULE RAW	01	3	1.000	B
147818	WASHER/DISP.MODULE RAW	01	4	2.000	B
147919	END MODULE RAW	02	5	1.000	B
147549	CONTAINER STACK RAW	00	6	1.000	C
147601	MAIN SHUTTLE RAIL MEDIUM	00	7	1.000	C
147921	TRANSPARENT COVER MEDIUM	00	8	1.000	C
147852	LOWER FRONT PANEL SMALL	00	10	1.000	C
147858	W/D DRAWER FRONT	00	11	2.000	C
147861	END MODULE DRAWER FRONT	00	12	1.000	C
147849	LEFT SIDE PANEL	00	13	1.000	C
147865	RIGHT SIDE COVER	00	14	1.000	C
147847	DOOR MANUAL BOX	00	15	1.000	C
147831	TOP COVER MEDIUM	00	16	1.000	C
147840	UPPER FRONT MEDIUM	00	17	1.000	C
147870	CONTAINER STACK TOP COVER	00	18	1.000	C
147873	STRIP CONTAINER STACK	00	19	1.000	C
147875	BOTTOM STRIP	00	20	1.000	C
147867	CONTAINER STACK DOOR	00	22	1.000	C
147923	BRACKET 1	00	25	2.000	
147924	BRACKET 2	00	26	2.000	
147925	BRACKET 3	00	27	1.000	
147926	DRAWER BRACKET	00	28	3.000	
147928	TOOLS SUPPORT	00	30	1.000	
147946	SCHARNIER	00	32	2.000	C
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	40	3.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	22.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	14.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	52	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	53	5.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	54	1.000	
409271	U-SCHEIBE M 4 DIN125A	00	57	9.000	
409410	U-SCHEIBE M 3 DIN125A	00	59	4.000	
144280	SICHERUNGSSCHEIBE	00	60	1.000	
147624	WASH FLUID CONTAINER	03	71	8.000	Z
281107	WASTE CONTAINER	00	72	3.000	Z
255517	TYPENSCHILD M1000+/M/OEM	00	85	1.000	
255044	LABEL VERPA MLFAME	01	86	1.000	
255043	LABEL SPANNUNGSKENNZEICHNUNG	00	87	1.000	
147768	EXIT-STACK COVER	00	101	1.000	C
400267	ZYL-SCHR.M 3X16 DIN912 A2	00	102	10.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	103	4.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	104	1.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	105	1.000	
255523	LABEL HUOSING PART MLFAME	00	106	1.000	
255529	LABEL 3-WEGVERPACKUNG	00	108	1.000	
220123	PALLET LARGE	00	110	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
220131	STACK COVERING LARGE	00	111	1.000	
220132	MODULES COVERING LARGE	00	112	1.000	
220133	PROTECTIVE INSERT 1 LARGE	00	113	1.000	
220134	PROTECTIVE INSERT 2 LARGE	00	114	1.000	
220135	INSTRUMENT BOX LARGE	00	115	1.000	
220136	CARDBOARD TOP LARGE	00	116	1.000	
220143	HOUSING PANELS BOX LARGE	00	118	1.000	
608301	TECHN. STAND ML FAME	01	119	1.000	
608296	Q-BESCHEINIGUNG ML FAME	02	120	1.000	
220156	BAG	00	121	6.000	
146302	CABLE W60	00	130	2.000	Z
146373	SUBSTITUTE PLUG	00	131	2.000	Z
146385	CABLE P14	00	132	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	133	3.000	Z
147660	ENTRY STACK	00	134	1.000	Z
147670	HEIGHT MOVER TOOL	00	135	1.000	Z
147677	PLATEFORK	00	136	1.000	Z
148335	WASTE CAP	00	137	2.000	Z
147930	REAGENT CONTAINER SET	01	138	3.000	Z
147931	DISPOSABLE SYRINGE SET	01	139	3.000	V
147933	REAGENT BAR CODE LABEL SET	00	140	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	141	2.000	V
147935	MTP-TRANSPORTER	00	142	1.000	Z
147936	CLEANING SET MANIFOLD	00	143	2.000	Z
148163	CALIBRATION BOLT	00	144	1.000	T
148245	SETSCREW	00	145	2.000	A
220127	SHIPPING KIT PACKAGING	00	146	1.000	
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	147	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	148	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	149	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	150	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	151	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	152	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	153	1.000	Z
239021	R?CKSPIEGEL D= 24 L= 165	00	154	1.000	Z
255524	LABEL SHIPPING KIT MLFAME	01	155	1.000	
281093	MG VERSCHL.-BEUTEL 50x75	00	156	3.000	
369064	BATTERIE MN 2400 LR 03 1.5V	00	157	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	158	2.000	
409200	U-SCHEIBE M3 DIN9021B	00	159	6.000	
622023	PACKING LIST ML FAME	05	160	1.000	
148333	SPILLAGE TRAY	00	161	1.000	Z
148337	WASH FLUID CONT. STAND	00	162	1.000	Z
281153	STERIL-FILTER	00	163	2.000	V
148358	VENTING TUBING	00	164	2.000	V
255653	LABEL WARNING PC	00	165	2.000	
279403	MICRO WELL PLATTE	00	166	2.000	Z
255062	T?V GEPR?FTE SICHERHEIT GS	00	170	1.000	
147878	WASTE TUBING	00	180	2.000	Z

Sanofi Concerto 24/20 - Part No. 146 012 REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147150	CHASSIS	00	1	1.000	C
147787	ENTRY MODULE RAW	01	2	1.000	B
147788	INKUBATOR MODULE RAW	01	3	1.000	B
147818	WASHER/DISP.MODULE RAW	01	4	2.000	B
147919	END MODULE RAW	02	5	1.000	B
147549	CONTAINER STACK RAW	00	6	1.000	C
147601	MAIN SHUTTLE RAIL MEDIUM	00	7	1.000	C
148326	TRANSPARENT COVER MEDIUM SAN.	00	8	1.000	C
148271	LOWER FRONT PANEL SMALL SANOFI	00	10	1.000	C
148273	W/D DRAWER FRONT SANOFI	00	11	2.000	C
148274	END MODULE DRAWER FRONT SANOFI	00	12	1.000	C
148270	LEFT SIDE PANEL SANOFI	00	13	1.000	C
148275	RIGHT SIDE COVER SANOFI	00	14	1.000	C
148269	DOOR MANUAL BOX SANOFI	00	15	1.000	C
148264	TOP COVER MEDIUM SANOFI	00	16	1.000	C
148267	UPPER FRONT MEDIUM SANOFI	00	17	1.000	C
148277	CONTAINER STACK TOP COVER SAN.	00	18	1.000	C
148278	STRIP CONTAINER STACK SANOFI	00	19	1.000	C
148279	BOTTOM STRIP SANOFI	00	20	1.000	C
148276	CONTAINER STACK DOOR SANOFI	00	22	1.000	C
147923	BRACKET 1	00	25	2.000	
147924	BRACKET 2	00	26	2.000	
147925	BRACKET 3	00	27	1.000	
147926	DRAWER BRACKET	00	28	3.000	
147928	TOOLS SUPPORT	00	30	1.000	
147946	SCHARNIER	00	32	2.000	C
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	40	3.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	22.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	14.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	52	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	53	5.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	54	1.000	
409271	U-SCHEIBE M 4 DIN125A	00	57	9.000	
409410	U-SCHEIBE M 3 DIN125A	00	59	4.000	
144280	SICHERUNGSSCHEIBE	00	60	1.000	
147624	WASH FLUID CONTAINER	03	71	8.000	Z
281107	WASTE CONTAINER	00	72	3.000	Z
255517	TYPENSCHILD M1000+/M/OEM	00	85	1.000	
255635	LABEL VERPACKUNG CONCERTO	00	86	1.000	
255043	LABEL SPANNUNGSKENNZEICHNUNG	00	87	1.000	
147768	EXIT-STACK COVER	00	101	1.000	C
400267	ZYL-SCHR.M 3X16 DIN912 A2	00	102	10.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	103	4.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	104	1.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	105	1.000	
255637	LABEL HOUSING PARTS CON.	00	106	1.000	
255529	LABEL 3-WEGVERPACKUNG	00	108	1.000	
220123	PALLET LARGE	00	110	1.000	

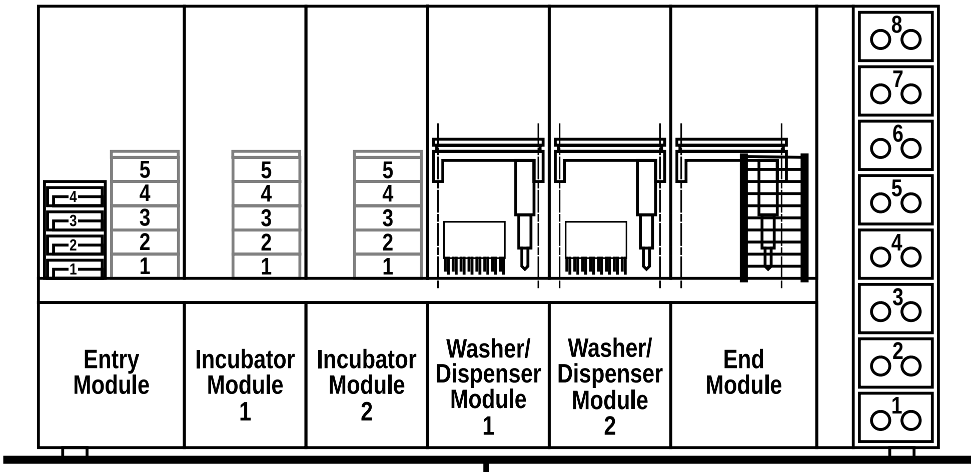
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
220131	STACK COVERING LARGE	00	111	1.000	
220132	MODULES COVERING LARGE	00	112	1.000	
220133	PROTECTIVE INSERT 1 LARGE	00	113	1.000	
220134	PROTECTIVE INSERT 2 LARGE	00	114	1.000	
220135	INSTRUMENT BOX LARGE	00	115	1.000	
220136	CARDBOARD TOP LARGE	00	116	1.000	
220143	HOUSING PANELS BOX LARGE	00	118	1.000	
608301	TECHN. STAND ML FAME	01	119	1.000	
608296	Q-BESCHEINIGUNG ML FAME	02	120	1.000	
220156	BAG	00	121	6.000	
146302	CABLE W60	00	130	2.000	Z
146373	SUBSTITUTE PLUG	00	131	2.000	Z
146385	CABLE P14	00	132	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	133	3.000	Z
148323	ENTRY STACK SANOFI	00	134	1.000	Z
147670	HEIGHT MOVER TOOL	00	135	1.000	Z
147677	PLATEFORK	00	136	1.000	Z
148335	WASTE CAP	00	137	2.000	Z
147930	REAGENT CONTAINER SET	01	138	3.000	Z
147931	DISPOSABLE SYRINGE SET	01	139	3.000	V
147933	REAGENT BAR CODE LABEL SET	00	140	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	141	2.000	V
147935	MTP-TRANSPORTER	00	142	1.000	Z
147936	CLEANING SET MANIFOLD	00	143	2.000	Z
148163	CALIBRATION BOLT	00	144	1.000	T
148245	SETSCREW	00	145	2.000	A
220127	SHIPPING KIT PACKAGING	00	146	1.000	
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	147	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	148	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	149	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	150	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	151	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	152	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	153	1.000	Z
239021	R?CKSPIEGEL D= 24 L= 165	00	154	1.000	Z
255636	LABEL SHIP-KIT CONCERTO	00	155	1.000	
281093	MG VERSCHL.-BEUTEL 50x75	00	156	3.000	
369064	BATTERIE MN 2400 LR 03 1.5V	00	157	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	158	2.000	
622024	PACKING LIST CONCERTO	04	160	1.000	
148333	SPILLAGE TRAY	00	161	1.000	Z
148337	WASH FLUID CONT. STAND	00	162	1.000	Z
281153	STERIL-FILTER	00	163	2.000	V
148358	VENTING TUBING	00	164	2.000	V
255653	LABEL WARNING PC	00	165	2.000	
279403	MICRO WELL PLATTE	00	166	2.000	Z
255062	T?V GEPR?FTE SICHERHEIT GS	00	170	1.000	
147878	WASTE TUBING	00	180	2.000	Z

Ortho Summit Processor 24/20 - Part No. 146 022 REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147150	CHASSIS	00	1	1.000	C
147787	ENTRY MODULE RAW	01	2	1.000	B
147788	INKUBATOR MODULE RAW	01	3	1.000	B
147818	WASHER/DISP.MODULE RAW	01	4	2.000	B
147919	END MODULE RAW	02	5	1.000	B
147549	CONTAINER STACK RAW	00	6	1.000	C
147601	MAIN SHUTTLE RAIL MEDIUM	00	7	1.000	C
147921	TRANSPARENT COVER MEDIUM	00	8	1.000	C
148290	LOWER FRONT PANEL SMALL ORTHO	00	10	1.000	C
148292	W/D DRAWER FRONT ORTHO	00	11	2.000	C
148293	END MODULE DRAWER FRONT ORTHO	00	12	1.000	C
148289	LEFT SIDE PANEL ORTHO	00	13	1.000	C
148294	RIGHT SIDE COVER ORTHO	00	14	1.000	C
148288	DOOR MANUAL BOX ORTHO	00	15	1.000	C
148282	TOP COVER MEDIUM ORTHO	00	16	1.000	C
148286	UPPER FRONT MEDIUM ORTHO	00	17	1.000	C
148296	CONTAINER STACK TOP COVER ORT.	00	18	1.000	C
148297	STRIP CONTAINER STACK ORTHO	00	19	1.000	C
148298	BOTTOM STRIP ORTHO	00	20	1.000	C
148295	CONTAINER STACK DOOR ORTHO	00	22	1.000	C
147923	BRACKET 1	00	25	2.000	
147924	BRACKET 2	00	26	2.000	
147925	BRACKET 3	00	27	1.000	
147926	DRAWER BRACKET	00	28	3.000	
147928	TOOLS SUPPORT	00	30	1.000	
147946	SCHARNIER	00	32	2.000	C
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	40	3.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	22.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	14.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	52	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	53	5.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	54	1.000	
409271	U-SCHEIBE M 4 DIN125A	00	57	9.000	
409410	U-SCHEIBE M 3 DIN125A	00	59	4.000	
144280	SICHERUNGSSCHEIBE	00	60	1.000	
147624	WASH FLUID CONTAINER	03	71	8.000	Z
281107	WASTE CONTAINER	00	72	3.000	Z
255517	TYPENSCHILD M1000+/M/OEM	00	85	1.000	
255521	LABEL VERPA MLFAME 24/20	00	86	1.000	
255043	LABEL SPANNUNGSKENNZEICHNUNG	00	87	1.000	
147768	EXIT-STACK COVER	00	101	1.000	C
400267	ZYL-SCHR.M 3X16 DIN912 A2	00	102	10.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	103	4.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	104	1.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	105	1.000	
255523	LABEL HUOSING PART MLFAME	00	106	1.000	
255529	LABEL 3-WEGVERPACKUNG	00	108	1.000	
220123	PALLET LARGE	00	110	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
220131	STACK COVERING LARGE	00	111	1.000	
220132	MODULES COVERING LARGE	00	112	1.000	
220133	PROTECTIVE INSERT 1 LARGE	00	113	1.000	
220134	PROTECTIVE INSERT 2 LARGE	00	114	1.000	
220135	INSTRUMENT BOX LARGE	00	115	1.000	
220136	CARDBOARD TOP LARGE	00	116	1.000	
220143	HOUSING PANELS BOX LARGE	00	118	1.000	
608301	TECHN. STAND ML FAME	01	119	1.000	
608296	Q-BESCHEINIGUNG ML FAME	02	120	1.000	
220156	BAG	00	121	6.000	
146302	CABLE W60	00	130	2.000	Z
146373	SUBSTITUTE PLUG	00	131	2.000	Z
146385	CABLE P14	00	132	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	133	3.000	Z
147660	ENTRY STACK	00	134	1.000	Z
147670	HEIGHT MOVER TOOL	00	135	1.000	Z
147677	PLATEFORK	00	136	1.000	Z
148335	WASTE CAP	00	137	2.000	Z
147930	REAGENT CONTAINER SET	01	138	3.000	Z
147931	DISPOSABLE SYRINGE SET	01	139	3.000	V
147933	REAGENT BAR CODE LABEL SET	00	140	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	141	2.000	V
147935	MTP-TRANSPORTER	00	142	1.000	Z
147936	CLEANING SET MANIFOLD	00	143	2.000	Z
148163	CALIBRATION BOLT	00	144	1.000	T
148245	SETSCREW	00	145	2.000	A
220127	SHIPPING KIT PACKAGING	00	146	1.000	
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	147	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	148	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	149	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	150	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	151	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	152	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	153	1.000	Z
239021	R?CKSPIEGEL D= 24 L= 165	00	154	1.000	Z
255524	LABEL SHIPPING KIT MLFAME	01	155	1.000	
281093	MG VERSCHL.-BEUTEL 50x75	00	156	3.000	
369064	BATTERIE MN 2400 LR 03 1.5V	00	157	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	158	2.000	
622025	PACKING LIST ORTHO	05	160	1.000	
148333	SPILLAGE TRAY	00	161	1.000	Z
148337	WASH FLUID CONT. STAND	00	162	1.000	Z
281153	STERIL-FILTER	00	163	2.000	V
148358	VENTING TUBING	00	164	2.000	V
255653	LABEL WARNING PC	00	165	2.000	
279403	MICRO WELL PLATTE	00	166	2.000	Z
255062	T?V GEPR?FTE SICHERHEIT GS	00	170	1.000	
147878	WASTE TUBING	00	180	2.000	Z

1.1.3.3.5 Configuration 24/30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Entry Module
Incubator Module 1
Incubator Module 2
Washer/ Dispenser Module 1
Washer/ Dispenser Module 2
End Module

Basic Instrument 24/30
Hamilton p/n 146 003 - Sanofi p/n 146 013 - Ortho p/n 146 023

- Chassis
- Entry Module Raw
- Incubator Module Raw
- Incubator Module Raw
- Washer/Dispenser Module Raw
- Washer/Dispenser Module Raw
- End Module Raw
- Container Stack Raw
- Main Shuttle Rail Large
- Transparent Cover Large

Microlab F.A.M.E. 24/30 - Part No. 146 003 REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147150	CHASSIS	00	1	1.000	C
147787	ENTRY MODULE RAW	01	2	1.000	B
147788	INKUBATOR MODULE RAW	01	3	2.000	B
147818	WASHER/DISP.MODULE RAW	01	4	2.000	B
147919	END MODULE RAW	02	5	1.000	B
147549	CONTAINER STACK RAW	00	6	1.000	C
147610	MAIN SHUTTLE RAIL LARGE	00	7	1.000	C
147922	TRANSPARENT COVER LARGE	00	8	1.000	C
147855	LOWER FRONT PANEL LARGE	00	10	1.000	C
147858	W/D DRAWER FRONT	00	11	2.000	C
147861	END MODULE DRAWER FRONT	00	12	1.000	C
147849	LEFT SIDE PANEL	00	13	1.000	C
147865	RIGHT SIDE COVER	00	14	1.000	C
147847	DOOR MANUAL BOX	00	15	1.000	C
147834	TOP COVER LARGE	00	16	1.000	C
147843	UPPER FRONT LARGE	00	17	1.000	C
147870	CONTAINER STACK TOP COVER	00	18	1.000	C
147873	STRIP CONTAINER STACK	00	19	1.000	C
147875	BOTTOM STRIP	00	20	1.000	C
147867	CONTAINER STACK DOOR	00	22	1.000	C
147923	BRACKET 1	00	25	2.000	
147924	BRACKET 2	00	26	2.000	
147925	BRACKET 3	00	27	3.000	
147926	DRAWER BRACKET	00	28	3.000	
147928	TOOLS SUPPORT	00	30	1.000	
147946	SCHARNIER	00	32	2.000	C
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	40	3.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	26.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	14.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	52	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	53	5.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	54	1.000	
409271	U-SCHEIBE M 4 DIN125A	00	57	9.000	
409410	U-SCHEIBE M 3 DIN125A	00	59	4.000	
144280	SICHERUNGSSCHEIBE	00	60	1.000	
147624	WASH FLUID CONTAINER	03	71	8.000	Z
281107	WASTE CONTAINER	00	72	3.000	Z
255517	TYPENSCHILD M1000+/M/OEM	00	85	1.000	
255044	LABEL VERPA MLFAME	01	86	1.000	
255043	LABEL SPANNUNGSKENNZEICHNUNG	00	87	1.000	
147768	EXIT-STACK COVER	00	101	1.000	C
400267	ZYL-SCHR.M 3X16 DIN912 A2	00	102	10.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	103	4.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	104	1.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	105	1.000	
255523	LABEL HUOSING PART MLFAME	00	106	1.000	
255529	LABEL 3-WEGVERPACKUNG	00	108	1.000	
220123	PALLET LARGE	00	110	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
220131	STACK COVERING LARGE	00	111	1.000	
220132	MODULES COVERING LARGE	00	112	1.000	
220133	PROTECTIVE INSERT 1 LARGE	00	113	1.000	
220134	PROTECTIVE INSERT 2 LARGE	00	114	1.000	
220135	INSTRUMENT BOX LARGE	00	115	1.000	
220136	CARDBOARD TOP LARGE	00	116	1.000	
220143	HOUSING PANELS BOX LARGE	00	118	1.000	
608301	TECHN. STAND ML FAME	01	119	1.000	
608296	Q-BESCHEINIGUNG ML FAME	02	120	1.000	
220156	BAG	00	121	7.000	
146302	CABLE W60	00	130	2.000	Z
146373	SUBSTITUTE PLUG	00	131	2.000	Z
146385	CABLE P14	00	132	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	133	3.000	Z
147660	ENTRY STACK	00	134	1.000	Z
147670	HEIGHT MOVER TOOL	00	135	1.000	Z
147677	PLATEFORK	00	136	1.000	Z
148335	WASTE CAP	00	137	2.000	Z
147930	REAGENT CONTAINER SET	01	138	3.000	Z
147931	DISPOSABLE SYRINGE SET	01	139	3.000	V
147933	REAGENT BAR CODE LABEL SET	00	140	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	141	2.000	V
147935	MTP-TRANSPORTER	00	142	1.000	Z
147936	CLEANING SET MANIFOLD	00	143	2.000	Z
148163	CALIBRATION BOLT	00	144	1.000	T
148245	SETSCREW	00	145	2.000	A
220127	SHIPPING KIT PACKAGING	00	146	1.000	
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	147	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	148	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	149	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	150	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	151	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	152	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	153	1.000	Z
239021	R?CKSPIEGEL D= 24 L= 165	00	154	1.000	Z
255524	LABEL SHIPPING KIT MLFAME	01	155	1.000	
281093	MG VERSCHL.-BEUTEL 50x75	00	156	3.000	
369064	BATTERIE MN 2400 LR 03 1.5V	00	157	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	158	2.000	
409200	U-SCHEIBE M3 DIN9021B	00	159	6.000	
622023	PACKING LIST ML FAME	05	160	1.000	
148333	SPILLAGE TRAY	00	161	1.000	Z
148337	WASH FLUID CONT. STAND	00	162	1.000	Z
281153	STERIL-FILTER	00	163	2.000	V
148358	VENTING TUBING	00	164	2.000	V
255653	LABEL WARNING PC	00	165	2.000	
279403	MICRO WELL PLATTE	00	166	2.000	Z
255062	T?V GEPR?FTE SICHERHEIT GS	00	170	1.000	
147878	WASTE TUBING	00	180	2.000	Z

Sanofi Concerto 24/30 - Part No. 146 013 REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
622024	PACKING LIST CONCERTO	02	0	1.000	
147150	CHASSIS	00	1	1.000	C
147787	ENTRY MODULE RAW	00	2	1.000	B
147788	INKUBATOR MODULE RAW	00	3	2.000	B
147818	WASHER/DISP.MODULE RAW	00	4	2.000	B
147919	END MODULE RAW	00	5	1.000	B
147549	CONTAINER STACK RAW	00	6	1.000	C
147610	MAIN SHUTTLE RAIL LARGE	00	7	1.000	C
148327	TRANSPARENT COVER LARGE SANOFI	00	8	1.000	C
148272	LOWER FRONT PANEL LARGE SANOFI	00	10	1.000	C
148273	W/D DRAWER FRONT SANOFI	00	11	2.000	C
148274	END MODULE DRAWER FRONT SANOFI	00	12	1.000	C
148270	LEFT SIDE PANEL SANOFI	00	13	1.000	C
148275	RIGHT SIDE COVER SANOFI	00	14	1.000	C
148269	DOOR MANUAL BOX SANOFI	00	15	1.000	C
148265	TOP COVER LARGE SANOFI	00	16	1.000	C
148268	UPPER FRONT LARGE SANOFI	00	17	1.000	C
148277	CONTAINER STACK TOP COVER SAN.	00	18	1.000	C
148278	STRIP CONTAINER STACK SANOFI	00	19	1.000	C
148279	BOTTOM STRIP SANOFI	00	20	1.000	C
148276	CONTAINER STACK DOOR SANOFI	00	22	1.000	C
147923	BRACKET 1	00	25	2.000	
147924	BRACKET 2	00	26	2.000	
147925	BRACKET 3	00	27	3.000	
147926	DRAWER BRACKET	00	28	3.000	
147928	TOOLS SUPPORT	00	30	1.000	
147946	SCHARNIER	00	32	2.000	C
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	40	3.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	26.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	14.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	52	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	53	5.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	54	1.000	
409271	U-SCHEIBE M 4 DIN125A	00	57	9.000	
409410	U-SCHEIBE M 3 DIN125A	00	59	4.000	
144280	SICHERUNGSSCHEIBE	00	60	1.000	
147624	WASH FLUID CONTAINER	02	71	8.000	Z
281107	WASTE CONTAINER	00	72	3.000	Z
255517	TYPENSCHILD M1000+/M/OEM	00	85	1.000	
255635	LABEL VERPACKUNG CONCERTO	00	86	1.000	
255043	LABEL SPANNUNGSKENNZEICHNUNG	00	87	1.000	
147768	EXIT-STACK COVER	00	101	1.000	C
400267	ZYL-SCHR.M 3X16 DIN912 A2	00	102	10.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	103	4.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	104	1.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	105	1.000	
255637	LABEL HOUSING PARTS CON.	00	106	1.000	
255529	LABEL 3-WEGVERPACKUNG	00	108	1.000	

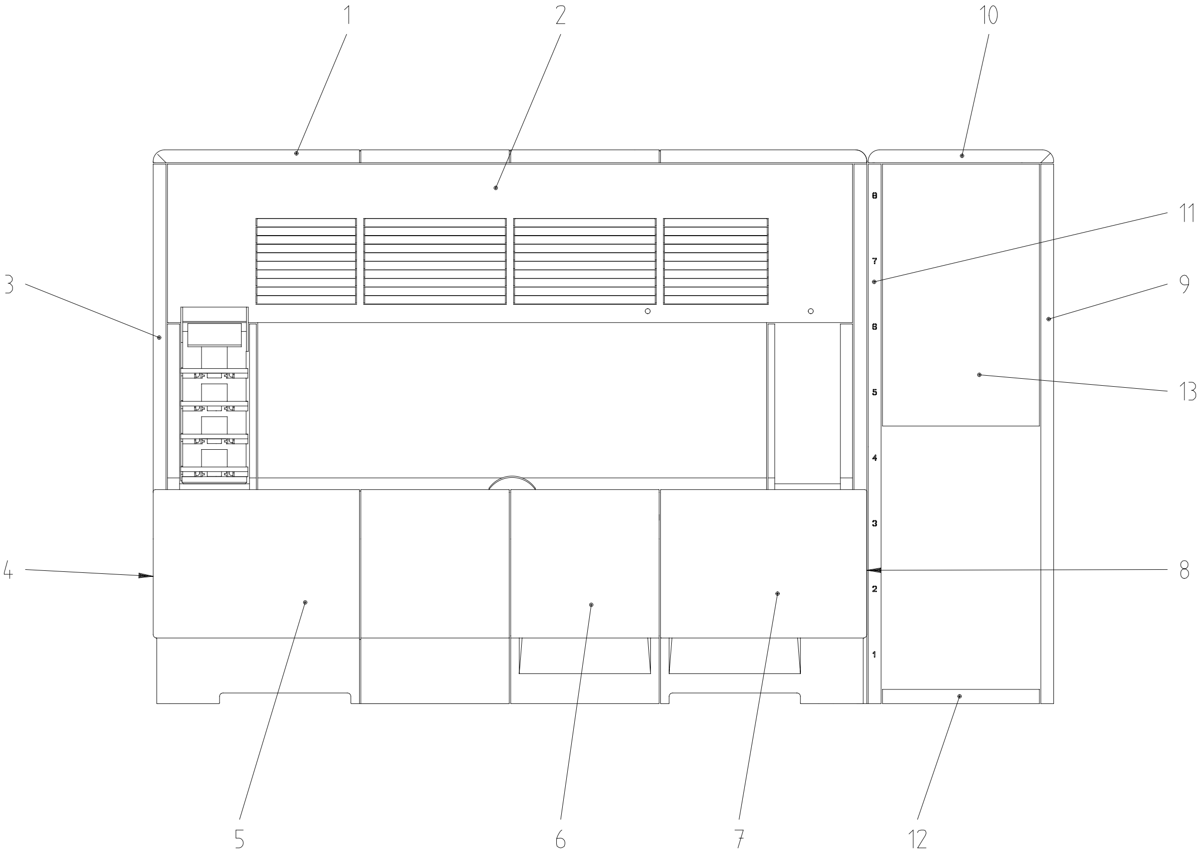
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
220123	PALLET LARGE	00	110	1.000	
220131	STACK COVERING LARGE	00	111	1.000	
220132	MODULES COVERING LARGE	00	112	1.000	
220133	PROTECTIVE INSERT 1 LARGE	00	113	1.000	
220134	PROTECTIVE INSERT 2 LARGE	00	114	1.000	
220135	INSTRUMENT BOX LARGE	00	115	1.000	
220136	CARDBOARD TOP LARGE	00	116	1.000	
220143	HOUSING PANELS BOX LARGE	00	118	1.000	
608301	TECHN. STAND ML FAME	00	119	1.000	
608296	Q-BESCHEINIGUNG ML FAME	01	120	1.000	
220156	BAG	00	121	7.000	
146302	CABLE W60	00	130	2.000	Z
146385	CABLE P14	00	132	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	133	3.000	Z
148323	ENTRY STACK SANOFI	00	134	1.000	Z
147670	HEIGHT MOVER TOOL	00	135	1.000	Z
147677	PLATEFORK	00	136	1.000	Z
148335	WASTE CAP	00	137	2.000	Z
147930	REAGENT CONTAINER SET	00	138	3.000	Z
147931	DISPOSABLE SYRINGE SET	01	139	3.000	V
147933	REAGENT BAR CODE LABEL SET	00	140	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	141	2.000	V
147935	MTP-TRANSPORTER	00	142	1.000	Z
147936	CLEANING SET MANIFOLD	00	143	2.000	Z
148163	CALIBRATION BOLT	00	144	1.000	T
148245	SETSCREW	00	145	2.000	A
220127	SHIPPING KIT PACKAGING	00	146	1.000	
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	147	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	148	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	149	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	150	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	151	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	152	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	153	1.000	Z
239021	RÜCKSPIEGEL D= 24 L= 165	00	154	1.000	Z
255636	LABEL SHIP-KIT CONCERTO	00	155	1.000	
281093	MG VERSCHL.-BEUTEL 50x75	00	156	3.000	
369064	BATTERIE MN 2400 LR 03 1.5V	00	157	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	158	2.000	
622024	PACKING LIST CONCERTO	02	160	1.000	
148333	SPILLAGE TRAY	00	161	1.000	Z
148337	WASH FLUID CONT. STAND	00	162	1.000	Z
281153	STERIL-FILTER	00	163	2.000	V
148358	VENTING TUBING	00	164	2.000	V
255653	LABEL WARNING PC	00	165	2.000	
279403	MICRO WELL PLATTE	00	166	2.000	Z

Ortho Summit Processor 24/30 - Part No. 146 023 REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
622025	PACKING LIST ORTHO	05	0	1.000	
147150	CHASSIS	00	1	1.000	C
147787	ENTRY MODULE RAW	01	2	1.000	B
147788	INKUBATOR MODULE RAW	01	3	2.000	B
147818	WASHER/DISP.MODULE RAW	01	4	2.000	B
147919	END MODULE RAW	02	5	1.000	B
147549	CONTAINER STACK RAW	00	6	1.000	C
147610	MAIN SHUTTLE RAIL LARGE	00	7	1.000	C
147922	TRANSPARENT COVER LARGE	00	8	1.000	C
148291	LOWER FRONT PANEL LARGE ORTHO	00	10	1.000	C
148292	W/D DRAWER FRONT ORTHO	00	11	2.000	C
148293	END MODULE DRAWER FRONT ORTHO	00	12	1.000	C
148289	LEFT SIDE PANEL ORTHO	00	13	1.000	C
148294	RIGHT SIDE COVER ORTHO	00	14	1.000	C
148288	DOOR MANUAL BOX ORTHO	00	15	1.000	C
148284	TOP COVER LARGE ORTHO	00	16	1.000	C
148287	UPPER FRONT LARGE ORTHO	00	17	1.000	C
148296	CONTAINER STACK TOP COVER ORT.	00	18	1.000	C
148297	STRIP CONTAINER STACK ORTHO	00	19	1.000	C
148298	BOTTOM STRIP ORTHO	00	20	1.000	C
148295	CONTAINER STACK DOOR ORTHO	00	22	1.000	C
147923	BRACKET 1	00	25	2.000	
147924	BRACKET 2	00	26	2.000	
147925	BRACKET 3	00	27	3.000	
147926	DRAWER BRACKET	00	28	3.000	
147928	TOOLS SUPPORT	00	30	1.000	
147946	SCHARNIER	00	32	2.000	C
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	40	3.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	26.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	14.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	52	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	53	5.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	54	1.000	
409271	U-SCHEIBE M 4 DIN125A	00	57	9.000	
409410	U-SCHEIBE M 3 DIN125A	00	59	4.000	
144280	SICHERUNGSSCHEIBE	00	60	1.000	
147624	WASH FLUID CONTAINER	03	71	8.000	Z
281107	WASTE CONTAINER	00	72	3.000	Z
255517	TYPENSCHILD M1000+/M/OEM	00	85	1.000	
255522	LABEL VERPA MLFAME 24/30	00	86	1.000	
255043	LABEL SPANNUNGSKENNZEICHNUNG	00	87	1.000	
147768	EXIT-STACK COVER	00	101	1.000	C
400267	ZYL-SCHR.M 3X16 DIN912 A2	00	102	10.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	103	4.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	104	1.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	105	1.000	
255523	LABEL HUOSING PART MLFAME	00	106	1.000	
255529	LABEL 3-WEGVERPACKUNG	00	108	1.000	

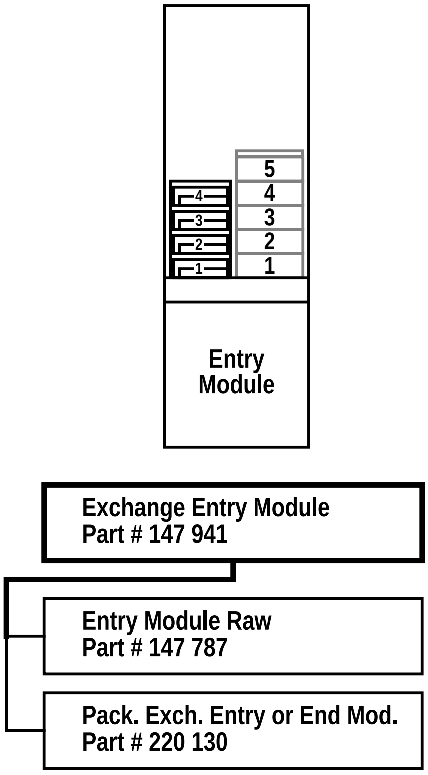
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
220123	PALLET LARGE	00	110	1.000	
220131	STACK COVERING LARGE	00	111	1.000	
220132	MODULES COVERING LARGE	00	112	1.000	
220133	PROTECTIVE INSERT 1 LARGE	00	113	1.000	
220134	PROTECTIVE INSERT 2 LARGE	00	114	1.000	
220135	INSTRUMENT BOX LARGE	00	115	1.000	
220136	CARDBOARD TOP LARGE	00	116	1.000	
220143	HOUSING PANELS BOX LARGE	00	118	1.000	
608301	TECHN. STAND ML FAME	01	119	1.000	
608296	Q-BESCHEINIGUNG ML FAME	02	120	1.000	
220156	BAG	00	121	7.000	
146302	CABLE W60	00	130	2.000	Z
146373	SUBSTITUTE PLUG	00	131	2.000	Z
146385	CABLE P14	00	132	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	133	3.000	Z
147660	ENTRY STACK	00	134	1.000	Z
147670	HEIGHT MOVER TOOL	00	135	1.000	Z
147677	PLATEFORK	00	136	1.000	Z
148335	WASTE CAP	00	137	2.000	Z
147930	REAGENT CONTAINER SET	01	138	3.000	Z
147931	DISPOSABLE SYRINGE SET	01	139	3.000	V
147933	REAGENT BAR CODE LABEL SET	00	140	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	141	2.000	V
147935	MTP-TRANSPORTER	00	142	1.000	Z
147936	CLEANING SET MANIFOLD	00	143	2.000	Z
148163	CALIBRATION BOLT	00	144	1.000	T
148245	SETSCREW	00	145	2.000	A
220127	SHIPPING KIT PACKAGING	00	146	1.000	
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	147	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	148	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	149	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	150	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	151	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	152	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	153	1.000	Z
239021	R?CKSPIEGEL D= 24 L= 165	00	154	1.000	Z
255524	LABEL SHIPPING KIT MLFAME	01	155	1.000	
281093	MG VERSCHL.-BEUTEL 50x75	00	156	3.000	
369064	BATTERIE MN 2400 LR 03 1.5V	00	157	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	158	2.000	
622025	PACKING LIST ORTHO	05	160	1.000	
148333	SPILLAGE TRAY	00	161	1.000	Z
148337	WASH FLUID CONT. STAND	00	162	1.000	Z
281153	STERIL-FILTER	00	163	2.000	V
148358	VENTING TUBING	00	164	2.000	V
255653	LABEL WARNING PC	00	165	2.000	
279403	MICRO WELL PLATTE	00	166	2.000	Z
255062	T?V GEPR?FTE SICHERHEIT GS	00	170	1.000	
147878	WASTE TUBING	00	180	2.000	Z

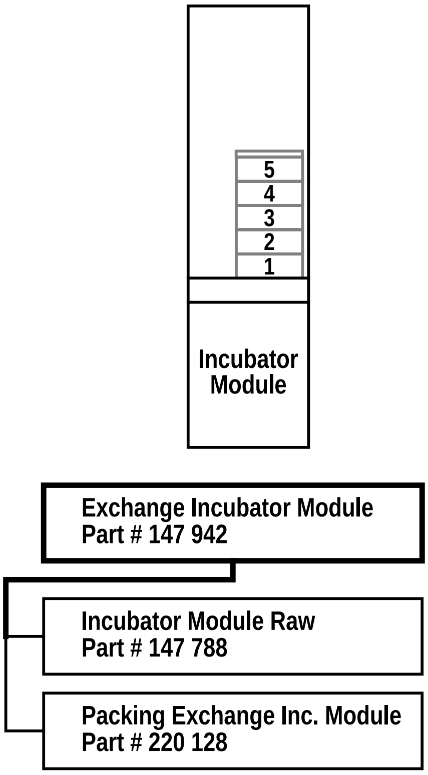
1.1.3.3.6 OEM specific Part Numbers



		HAMILTON				SANOFI / PASTEUR				ORTHO			
		MICROLAB F.A.M.E. 16 / 20	MICROLAB F.A.M.E. 16 / 30	MICROLAB F.A.M.E. 24 / 20	MICROLAB F.A.M.E. 24 / 30	MICROLAB F.A.M.E. 16 / 20 CONCERTO	MICROLAB F.A.M.E. 16 / 30 CONCERTO	MICROLAB F.A.M.E. 24 / 20 CONCERTO	MICROLAB F.A.M.E. 24 / 30 CONCERTO	MICROLAB F.A.M.E. 16 / 20 SUMMIT	MICROLAB F.A.M.E. 16 / 30 SUMMIT	MICROLAB F.A.M.E. 24 / 20 SUMMIT	MICROLAB F.A.M.E. 24 / 30 SUMMIT
1	TOP COVER SMALL	147828				148263				148281			
1	TOP COVER MEDIUM		147831	147831			148264	148264			148282	148282	
1	TOP COVER LARGE				147834				148265				148284
2	UPPER FRONT SMALL	147837				148266				148285			
2	UPPER FRONT MEDIUM		147840	147840			148267	148267			148286	148286	
2	UPPER FRONT LARGE				147843				148268				148287
3	DOOR MANUAL BOX	147847	147847	147847	147847	148269	148269	148269	148269	148288	148288	148288	148288
4	LEFT SIDE PANEL	147849	147849	147849	147849	148270	148270	148270	148270	148289	148289	148289	148289
5	LOWER FRONT PANEL SMALL	147852		147852		148271		148271		148290		148290	
5	LOWER FRONT PANEL LARGE		147855		147855		148272		148272		148291		148291
6	W / D DRAWER FRONT	147858	147858	147858	147858	148273	148273	148273	148273	148292	148292	148292	148292
7	END MODULE DRAWER FRONT	147861	147861	147861	147861	148274	148274	148274	148274	148293	148293	148293	148293
8	RIGHT SIDE COVER	147865	147865	147865	147865	148275	148275	148275	148275	148294	148294	148294	148294
9	CONTAINER STACK DOOR	147867	147867	147867	147867	148276	148276	148276	148276	148295	148295	148295	148295
10	CONTAINER STACK TOP COVER	147870	147870	147870	147870	148277	148277	148277	148277	148296	148296	148296	148296
11	STRIP CONTAINER STACK	147873	147873	147873	147873	148278	148278	148278	148278	148297	148297	148297	148297
12	BOTTOM STRIP	147875	147875	147875	147875	148279	148279	148279	148279	148298	148298	148298	148298
13	COVER WASH CONTAINER	147877	147877	147877	147877	148280	148280	148280	148280	148299	148299	148299	148299

1.1.3.3.7 Exchange Modules and Exchange Module Parts Lists


5
4
3
2
1
4
3
2
1
Entry Module
Exchange Entry Module
Part # 147 941
Entry Module Raw
Part # 147 787
Pack. Exch. Entry or End Mod.
Part # 220 130

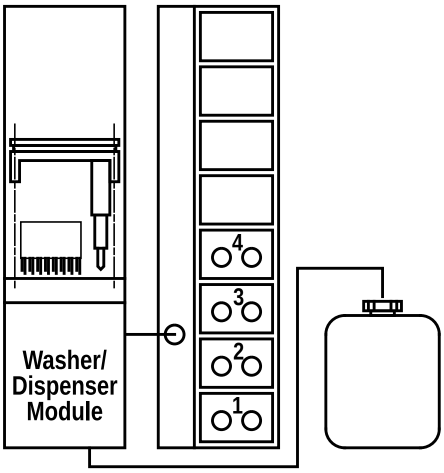

5
4
3
2
1
Incubator Module
Exchange Incubator Module
Part # 147 942
Incubator Module Raw
Part # 147 788
Packing Exchange Inc. Module
Part # 220 128

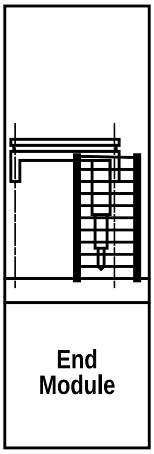
EXCHANGE ENTRY MODULE (P/N 147 941) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147787	ENTRY MODULE RAW	01	1	1.000	B
220156	BAG	00	2	1.000	
220159	FOAM TOP MODULE	00	3	1.000	
220160	CARDBOARD TOP MODULE	00	4	1.000	
220161	MODULE PALLET	00	5	1.000	
220162	MODULE BOX	00	6	1.000	
255527	LABEL EXCH. MOD. ML FAME	00	7	1.000	
255528	LABEL MEHRWEGVERPACKUNG	00	8	1.000	

EXCHANGE INCUBATOR MODULE (P/N 147 942) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147788	INKUBATOR MODULE RAW	01	1	1.000	B
220156	BAG	00	2	1.000	
220158	BLANKING FOAM	00	3	1.000	
220159	FOAM TOP MODULE	00	4	1.000	
220160	CARDBOARD TOP MODULE	00	5	1.000	
220161	MODULE PALLET	00	6	1.000	
220162	MODULE BOX	00	7	1.000	
255527	LABEL EXCH. MOD. ML FAME	00	8	1.000	
255528	LABEL MEHRWEGVERPACKUNG	00	9	1.000	





Exchange Washer/Disp Module
Part # 147 943

Washer/Disp. Module Raw
Part # 147 818

Pack. Exch. Washer/Disp. Mod.
Part # 220 129

Exchange End Module
Part # 147 944

End Module Raw
Part # 147 919

Pack. Exch. Entry or End Mod.
Part # 220 130

EXCHANGE WASHER/DISP. MODULE (P/N 147 943) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147818	WASHER/DISP.MODULE RAW	01	1	1.000	B
220156	BAG	00	2	1.000	
220158	BLANKING FOAM	00	3	1.000	
220159	FOAM TOP MODULE	00	4	1.000	
220160	CARDBOARD TOP MODULE	00	5	1.000	
220162	MODULE BOX	00	6	1.000	
255527	LABEL EXCH. MOD. ML FAME	00	7	1.000	
255528	LABEL MEHRWEGVERPACKUNG	00	8	1.000	
147488	EXTERNAL PUMP STATION	02	9	0.000	B
220161	MODULE PALLET	00	10	1.000	

EXCHANGE END MODULE (P/N 147 944) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147919	END MODULE RAW	02	1	1.000	B
220156	BAG	00	2	1.000	
220159	FOAM TOP MODULE	00	3	1.000	
220160	CARDBOARD TOP MODULE	00	4	1.000	
220161	MODULE PALLET	00	5	1.000	
220162	MODULE BOX	00	6	1.000	
255527	LABEL EXCH. MOD. ML FAME	00	7	1.000	
255528	LABEL MEHRWEGVERPACKUNG	00	8	1.000	
147255	FILTER CASE COMPLETE	03	9	0.000	Z

1.1.3.3.8 Expansion Modules and Expansion Module Parts Lists

See section 1.1.8 for installing Expansion Modules.

Hamilton Microlab F.A.M.E.

- ❐ 148 301 Exp. module 16 / 20 to 16 / 30
- ❐ 148 302 Exp. module 16 / 20 to 24 / 20
- ❐ 148 303 Exp. module 16 / 20 to 24 / 30
- ❐ 148 304 Exp. module 16 / 30 to 24 / 30
- ❐ 148 305 Exp. module 24 / 20 to 24 / 30

EXPANSION FROM 16/20 TO 16/30 (P/N 148 301) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147788	INKUBATOR MODULE RAW	01	1	1.000	B
147855	LOWER FRONT PANEL LARGE	00	2	1.000	C
147925	BRACKET 3	00	3	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	4	4.000	
220161	MODULE PALLET	00	5	1.000	
220162	MODULE BOX	00	6	1.000	
220159	FOAM TOP MODULE	00	7	1.000	
220158	BLANKING FOAM	00	8	1.000	
220156	BAG	00	9	1.000	
220160	CARDBOARD TOP MODULE	00	10	1.000	
147601	MAIN SHUTTLE RAIL MEDIUM	00	11	1.000	C
147921	TRANSPARENT COVER MEDIUM	00	12	1.000	C
147840	UPPER FRONT MEDIUM	00	13	1.000	C
147831	TOP COVER MEDIUM	00	14	1.000	C
220143	HOUSING PANELS BOX LARGE	00	15	1.000	
255525	LABEL EXP. PARTS MLFAME	01	16	2.000	
255529	LABEL 3-WEGVERPACKUNG	00	17	2.000	
622047	PACKING LIST EXPANSION ML FAME	00	18	1.000	

EXPANSION FROM 16/20 TO 24/20 (P/N 148 302) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147818	WASHER/DISP.MODULE RAW	01	1	1.000	B
147496	SHIPMENT SAFETY BRACKET	00	3	1.000	Z
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	4	4.000	
147858	W/D DRAWER FRONT	00	5	1.000	C
147926	DRAWER BRACKET	00	6	1.000	
146302	CABLE W60	00	7	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	8	1.000	Z

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147624	WASH FLUID CONTAINER	03	9	4.000	Z
148335	WASTE CAP	00	10	1.000	Z
147930	REAGENT CONTAINER SET	01	11	1.000	Z
147931	DISPOSABLE SYRINGE SET	01	12	1.000	V
147934	CONNECTION TUBING TO EXT.P.ST.	00	13	1.000	V
147936	CLEANING SET MANIFOLD	00	14	1.000	Z
281107	WASTE CONTAINER	00	15	1.000	Z
220161	MODULE PALLET	00	16	1.000	
220162	MODULE BOX	00	17	1.000	
220160	CARDBOARD TOP MODULE	00	18	1.000	
220159	FOAM TOP MODULE	00	19	1.000	
220158	BLANKING FOAM	00	20	1.000	
220156	BAG	00	21	1.000	
220165	EXP. SHIP. KIT PACKAGING	00	22	1.000	
147601	MAIN SHUTTLE RAIL MEDIUM	00	23	1.000	C
147921	TRANSPARENT COVER MEDIUM	00	24	1.000	C
147840	UPPER FRONT MEDIUM	00	25	1.000	C
147831	TOP COVER MEDIUM	00	26	1.000	C
220143	HOUSING PANELS BOX LARGE	00	27	1.000	
255525	LABEL EXP. PARTS MLFAME	01	28	3.000	
255529	LABEL 3-WEGVERPACKUNG	00	29	3.000	
409200	U-SCHEIBE M3 DIN9021B	00	30	2.000	
281153	STERIL-FILTER	00	31	1.000	V
148358	VENTING TUBING	00	32	1.000	V
622047	PACKING LIST EXPANSION ML FAME	00	33	1.000	
146373	SUBSTITUTE PLUG	00	40	1.000	Z
147878	WASTE TUBING	00	41	1.000	Z

EXPANSION FROM 16/20 TO 24/30 (P/N 148 303) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147788	INKUBATOR MODULE RAW	01	1	1.000	B
147818	WASHER/DISP.MODULE RAW	01	2	1.000	B
147496	SHIPMENT SAFETY BRACKET	00	4	1.000	Z
147855	LOWER FRONT PANEL LARGE	00	5	1.000	C
147925	BRACKET 3	00	6	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	7	8.000	
147858	W/D DRAWER FRONT	00	8	1.000	C
147926	DRAWER BRACKET	00	9	1.000	
146302	CABLE W60	00	10	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	11	1.000	Z
147624	WASH FLUID CONTAINER	03	12	4.000	Z
148335	WASTE CAP	00	13	1.000	Z
147930	REAGENT CONTAINER SET	01	14	1.000	Z
147931	DISPOSABLE SYRINGE SET	01	15	1.000	V
147934	CONNECTION TUBING TO EXT.P.ST.	00	16	1.000	V
147936	CLEANING SET MANIFOLD	00	17	1.000	Z
281107	WASTE CONTAINER	00	18	1.000	Z

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
220161	MODULE PALLET	00	19	2.000	
220162	MODULE BOX	00	20	2.000	
220160	CARDBOARD TOP MODULE	00	21	2.000	
220159	FOAM TOP MODULE	00	22	2.000	
220158	BLANKING FOAM	00	23	2.000	
220156	BAG	00	24	2.000	
220165	EXP. SHIP. KIT PACKAGING	00	25	1.000	
147610	MAIN SHUTTLE RAIL LARGE	00	26	1.000	C
147922	TRANSPARENT COVER LARGE	00	27	1.000	C
147843	UPPER FRONT LARGE	00	28	1.000	C
147834	TOP COVER LARGE	00	29	1.000	C
220143	HOUSING PANELS BOX LARGE	00	30	1.000	
255525	LABEL EXP. PARTS MLFAME	01	31	4.000	
255529	LABEL 3-WEGVERPACKUNG	00	32	4.000	
409200	U-SCHEIBE M3 DIN9021B	00	33	2.000	
281153	STERIL-FILTER	00	34	1.000	V
148358	VENTING TUBING	00	35	1.000	V
622047	PACKING LIST EXPANSION ML FAME	00	36	1.000	
146373	SUBSTITUTE PLUG	00	40	1.000	Z
147878	WASTE TUBING	00	41	1.000	Z

EXPANSION FROM 16/30 TO 24/30 (P/N 148 304) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147818	WASHER/DISP.MODULE RAW	01	2	1.000	B
147496	SHIPMENT SAFETY BRACKET	00	3	1.000	Z
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	4	4.000	
147858	W/D DRAWER FRONT	00	5	1.000	C
147926	DRAWER BRACKET	00	6	1.000	
146302	CABLE W60	00	7	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	8	1.000	Z
147624	WASH FLUID CONTAINER	03	9	4.000	Z
148335	WASTE CAP	00	10	1.000	Z
147930	REAGENT CONTAINER SET	01	11	1.000	Z
147931	DISPOSABLE SYRINGE SET	01	12	1.000	V
147934	CONNECTION TUBING TO EXT.P.ST.	00	13	1.000	V
147936	CLEANING SET MANIFOLD	00	14	1.000	Z
281107	WASTE CONTAINER	00	15	1.000	Z
220161	MODULE PALLET	00	16	1.000	
220162	MODULE BOX	00	17	1.000	
220160	CARDBOARD TOP MODULE	00	18	1.000	
220159	FOAM TOP MODULE	00	19	1.000	
220158	BLANKING FOAM	00	20	1.000	
220156	BAG	00	21	1.000	
220165	EXP. SHIP. KIT PACKAGING	00	22	0.000	
147610	MAIN SHUTTLE RAIL LARGE	00	23	1.000	C
147922	TRANSPARENT COVER LARGE	00	24	1.000	C
147843	UPPER FRONT LARGE	00	25	1.000	C

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147834	TOP COVER LARGE	00	26	1.000	C
220143	HOUSING PANELS BOX LARGE	00	27	1.000	
255525	LABEL EXP. PARTS MLFAME	01	28	3.000	
255529	LABEL 3-WEGVERPACKUNG	00	29	3.000	
409200	U-SCHEIBE M3 DIN9021B	00	30	2.000	
281153	STERIL-FILTER	00	31	1.000	V
148358	VENTING TUBING	00	32	1.000	V
622047	PACKING LIST EXPANSION ML FAME	00	33	1.000	
146373	SUBSTITUTE PLUG	00	40	1.000	Z
147878	WASTE TUBING	00	41	1.000	Z

EXPANSION FROM 24/20 TO 24/30 (P/N 148 305) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147788	INKUBATOR MODULE RAW	01	1	1.000	B
147855	LOWER FRONT PANEL LARGE	00	2	1.000	C
147925	BRACKET 3	00	3	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	4	4.000	
220161	MODULE PALLET	00	5	1.000	
220162	MODULE BOX	00	6	1.000	
220160	CARDBOARD TOP MODULE	00	7	1.000	
220159	FOAM TOP MODULE	00	8	1.000	
220158	BLANKING FOAM	00	9	1.000	
220156	BAG	00	10	1.000	
255525	LABEL EXP. PARTS MLFAME	01	11	2.000	
147610	MAIN SHUTTLE RAIL LARGE	00	12	1.000	C
147922	TRANSPARENT COVER LARGE	00	13	1.000	C
147843	UPPER FRONT LARGE	00	14	1.000	C
147834	TOP COVER LARGE	00	15	1.000	C
220143	HOUSING PANELS BOX LARGE	00	16	1.000	
255529	LABEL 3-WEGVERPACKUNG	00	17	2.000	
622047	PACKING LIST EXPANSION ML FAME	00	18	1.000	

Sanofi Concerto

- ☐ 148 311 Exp. module 16 / 20 to 16 / 30
- ☐ 148 312 Exp. module 16 / 20 to 24 / 20
- ☐ 148 313 Exp. module 16 / 20 to 24 / 30
- ☐ 148 314 Exp. module 16 / 30 to 24 / 30
- ☐ 148 315 Exp. module 24 / 20 to 24 / 30

EXPANSION FROM 16/20 TO 16/30 (P/N 148 311) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147788	INKUBATOR MODULE RAW	01	1	1.000	B
148272	LOWER FRONT PANEL LARGE SANOFI	00	2	1.000	C
147925	BRACKET 3	00	3	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	4	4.000	
220161	MODULE PALLET	00	5	1.000	
220162	MODULE BOX	00	6	1.000	
220159	FOAM TOP MODULE	00	7	1.000	
220158	BLANKING FOAM	00	8	1.000	
220156	BAG	00	9	1.000	
220160	CARDBOARD TOP MODULE	00	10	1.000	
147601	MAIN SHUTTLE RAIL MEDIUM	00	11	1.000	C
148326	TRANSPARENT COVER MEDIUM SAN.	00	12	1.000	C
148267	UPPER FRONT MEDIUM SANOFI	00	13	1.000	C
148264	TOP COVER MEDIUM SANOFI	00	14	1.000	C
220143	HOUSING PANELS BOX LARGE	00	15	1.000	
255635	LABEL VERPACKUNG CONCERTO	00	16	1.000	
255529	LABEL 3-WEGVERPACKUNG	00	17	2.000	
255637	LABEL HOUSING PARTS CON.	00	18	1.000	
622048	PACKING LIST EXPANSION CONCERT	00	19	1.000	

EXPANSION FROM 16/20 TO 24/20 (P/N 148 312) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147818	WASHER/DISP.MODULE RAW	01	1	1.000	B
147496	SHIPMENT SAFETY BRACKET	00	3	1.000	Z
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	4	4.000	
148273	W/D DRAWER FRONT SANOFI	00	5	1.000	C
147926	DRAWER BRACKET	00	6	1.000	
146302	CABLE W60	00	7	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	8	1.000	Z
147624	WASH FLUID CONTAINER	03	9	4.000	Z
148335	WASTE CAP	00	10	1.000	Z
147930	REAGENT CONTAINER SET	01	11	1.000	Z
147931	DISPOSABLE SYRINGE SET	01	12	1.000	V

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147934	CONNECTION TUBING TO EXT.P.ST.	00	13	1.000	V
147936	CLEANING SET MANIFOLD	00	14	1.000	Z
281107	WASTE CONTAINER	00	15	1.000	Z
220161	MODULE PALLET	00	16	1.000	
220162	MODULE BOX	00	17	1.000	
220160	CARDBOARD TOP MODULE	00	18	1.000	
220159	FOAM TOP MODULE	00	19	1.000	
220158	BLANKING FOAM	00	20	1.000	
220156	BAG	00	21	1.000	
220165	EXP. SHIP. KIT PACKAGING	00	22	1.000	
147601	MAIN SHUTTLE RAIL MEDIUM	00	23	1.000	C
148326	TRANSPARENT COVER MEDIUM SAN.	00	24	1.000	C
148267	UPPER FRONT MEDIUM SANOFI	00	25	1.000	C
148264	TOP COVER MEDIUM SANOFI	00	26	1.000	C
220143	HOUSING PANELS BOX LARGE	00	27	1.000	
255635	LABEL VERPACKUNG CONCERTO	00	28	2.000	
255529	LABEL 3-WEGVERPACKUNG	00	29	3.000	
409200	U-SCHEIBE M3 DIN9021B	00	30	2.000	
281153	STERIL-FILTER	00	31	1.000	V
148358	VENTING TUBING	00	32	1.000	V
255637	LABEL HOUSING PARTS CON.	00	33	1.000	
622048	PACKING LIST EXPANSION CONCERT	00	34	1.000	
146373	SUBSTITUTE PLUG	00	40	1.000	Z
147878	WASTE TUBING	00	41	1.000	Z

EXPANSION FROM 16/20 TO 24/30 (P/N 148 313) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147788	INKUBATOR MODULE RAW	01	1	1.000	B
147818	WASHER/DISP.MODULE RAW	01	2	1.000	B
147496	SHIPMENT SAFETY BRACKET	00	4	1.000	Z
148272	LOWER FRONT PANEL LARGE SANOFI	00	5	1.000	C
147925	BRACKET 3	00	6	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	7	8.000	
148273	W/D DRAWER FRONT SANOFI	00	8	1.000	C
147926	DRAWER BRACKET	00	9	1.000	
146302	CABLE W60	00	10	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	11	1.000	Z
147624	WASH FLUID CONTAINER	03	12	4.000	Z
148335	WASTE CAP	00	13	1.000	Z
147930	REAGENT CONTAINER SET	01	14	1.000	Z
147931	DISPOSABLE SYRINGE SET	01	15	1.000	V
147934	CONNECTION TUBING TO EXT.P.ST.	00	16	1.000	V
147936	CLEANING SET MANIFOLD	00	17	1.000	Z
281107	WASTE CONTAINER	00	18	1.000	Z
220161	MODULE PALLET	00	19	2.000	
220162	MODULE BOX	00	20	2.000	
220160	CARDBOARD TOP MODULE	00	21	2.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
220159	FOAM TOP MODULE	00	22	2.000	
220158	BLANKING FOAM	00	23	2.000	
220156	BAG	00	24	2.000	
220165	EXP. SHIP. KIT PACKAGING	00	25	1.000	
147610	MAIN SHUTTLE RAIL LARGE	00	26	1.000	C
148327	TRANSPARENT COVER LARGE SANOFI	00	27	1.000	C
148268	UPPER FRONT LARGE SANOFI	00	28	1.000	C
148265	TOP COVER LARGE SANOFI	00	29	1.000	C
220143	HOUSING PANELS BOX LARGE	00	30	1.000	
255635	LABEL VERPACKUNG CONCERTO	00	31	3.000	
255529	LABEL 3-WEGVERPACKUNG	00	32	4.000	
409200	U-SCHEIBE M3 DIN9021B	00	33	2.000	
281153	STERIL-FILTER	00	34	1.000	V
148358	VENTING TUBING	00	35	1.000	V
255637	LABEL HOUSING PARTS CON.	00	36	1.000	
622048	PACKING LIST EXPANSION CONCERT	00	37	1.000	
146373	SUBSTITUTE PLUG	00	40	1.000	Z
147878	WASTE TUBING	00	41	1.000	Z

EXPANSION FROM 16/30 TO 24/30 (P/N 148 314) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147818	WASHER/DISP.MODULE RAW	01	2	1.000	B
147496	SHIPMENT SAFETY BRACKET	00	3	1.000	Z
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	4	4.000	
148273	W/D DRAWER FRONT SANOFI	00	5	1.000	C
147926	DRAWER BRACKET	00	6	1.000	
146302	CABLE W60	00	7	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	8	1.000	Z
147624	WASH FLUID CONTAINER	03	9	4.000	Z
148335	WASTE CAP	00	10	1.000	Z
147930	REAGENT CONTAINER SET	01	11	1.000	Z
147931	DISPOSABLE SYRINGE SET	01	12	1.000	V
147934	CONNECTION TUBING TO EXT.P.ST.	00	13	1.000	V
147936	CLEANING SET MANIFOLD	00	14	1.000	Z
281107	WASTE CONTAINER	00	15	1.000	Z
220161	MODULE PALLET	00	16	1.000	
220162	MODULE BOX	00	17	1.000	
220160	CARDBOARD TOP MODULE	00	18	1.000	
220159	FOAM TOP MODULE	00	19	1.000	
220158	BLANKING FOAM	00	20	1.000	
220156	BAG	00	21	1.000	
220165	EXP. SHIP. KIT PACKAGING	00	22	0.000	
147610	MAIN SHUTTLE RAIL LARGE	00	23	1.000	C
148327	TRANSPARENT COVER LARGE SANOFI	00	24	1.000	C
148268	UPPER FRONT LARGE SANOFI	00	25	1.000	C
148265	TOP COVER LARGE SANOFI	00	26	1.000	C
220143	HOUSING PANELS BOX LARGE	00	27	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
255635	LABEL VERPACKUNG CONCERTO	00	28	2.000	
255529	LABEL 3-WEGVERPACKUNG	00	29	3.000	
409200	U-SCHEIBE M3 DIN9021B	00	30	2.000	
281153	STERIL-FILTER	00	31	1.000	V
148358	VENTING TUBING	00	32	1.000	V
255637	LABEL HOUSING PARTS CON.	00	33	1.000	
622048	PACKING LIST EXPANSION CONCERT	00	34	1.000	
146373	SUBSTITUTE PLUG	00	40	1.000	Z
147878	WASTE TUBING	00	41	1.000	Z

EXPANSION FROM 24/20 TO 24/30 (P/N 148 315) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147788	INKUBATOR MODULE RAW	01	1	1.000	B
148272	LOWER FRONT PANEL LARGE SANOFI	00	2	1.000	C
147925	BRACKET 3	00	3	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	4	4.000	
220161	MODULE PALLET	00	5	1.000	
220162	MODULE BOX	00	6	1.000	
220160	CARDBOARD TOP MODULE	00	7	1.000	
220159	FOAM TOP MODULE	00	8	1.000	
220158	BLANKING FOAM	00	9	1.000	
220156	BAG	00	10	1.000	
255525	LABEL EXP. PARTS MLFAME	01	11	2.000	
147610	MAIN SHUTTLE RAIL LARGE	00	12	1.000	C
148327	TRANSPARENT COVER LARGE SANOFI	00	13	1.000	C
148268	UPPER FRONT LARGE SANOFI	00	14	1.000	C
148265	TOP COVER LARGE SANOFI	00	15	1.000	C
220143	HOUSING PANELS BOX LARGE	00	16	1.000	
255529	LABEL 3-WEGVERPACKUNG	00	17	2.000	
622048	PACKING LIST EXPANSION CONCERT	00	18	1.000	

Ortho Summit Processor

- ❒ 148 316 Exp. module 16 / 20 to 16 / 30
- ❒ 148 317 Exp. module 16 / 20 to 24 / 20
- ❒ 148 318 Exp. module 16 / 20 to 24 / 30
- ❒ 148 319 Exp. module 16 / 30 to 24 / 30
- ❒ 148 320 Exp. module 24 / 20 to 24 / 30

EXPANSION FROM 16/20 TO 16/30 (P/N 148 316) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147788	INKUBATOR MODULE RAW	01	1	1.000	B
148291	LOWER FRONT PANEL LARGE ORTHO	00	2	1.000	C
147925	BRACKET 3	00	3	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	4	4.000	
220161	MODULE PALLET	00	5	1.000	
220162	MODULE BOX	00	6	1.000	
220159	FOAM TOP MODULE	00	7	1.000	
220158	BLANKING FOAM	00	8	1.000	
220156	BAG	00	9	1.000	
220160	CARDBOARD TOP MODULE	00	10	1.000	
147601	MAIN SHUTTLE RAIL MEDIUM	00	11	1.000	C
147921	TRANSPARENT COVER MEDIUM	00	12	1.000	C
148286	UPPER FRONT MEDIUM ORTHO	00	13	1.000	C
148282	TOP COVER MEDIUM ORTHO	00	14	1.000	C
220143	HOUSING PANELS BOX LARGE	00	15	1.000	
255525	LABEL EXP. PARTS MLFAME	01	16	2.000	
255529	LABEL 3-WEGVERPACKUNG	00	17	2.000	
622049	PACK.LIST EXPANSION ORTHO SUM.	00	18	1.000	

EXPANSION FROM 16/20 TO 24/20 (P/N 148 317) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147818	WASHER/DISP.MODULE RAW	01	1	1.000	B
147496	SHIPMENT SAFETY BRACKET	00	3	1.000	Z
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	4	4.000	
148292	W/D DRAWER FRONT ORTHO	00	5	1.000	C
147926	DRAWER BRACKET	00	6	1.000	
146302	CABLE W60	00	7	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	8	1.000	Z
147624	WASH FLUID CONTAINER	03	9	4.000	Z
148335	WASTE CAP	00	10	1.000	Z
147930	REAGENT CONTAINER SET	01	11	1.000	Z
147931	DISPOSABLE SYRINGE SET	01	12	1.000	V
147934	CONNECTION TUBING TO EXT.P.ST.	00	13	1.000	V

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147936	CLEANING SET MANIFOLD	00	14	1.000	Z
281107	WASTE CONTAINER	00	15	1.000	Z
220161	MODULE PALLET	00	16	1.000	
220162	MODULE BOX	00	17	1.000	
220160	CARDBOARD TOP MODULE	00	18	1.000	
220159	FOAM TOP MODULE	00	19	1.000	
220158	BLANKING FOAM	00	20	1.000	
220156	BAG	00	21	1.000	
220165	EXP. SHIP. KIT PACKAGING	00	22	1.000	
147601	MAIN SHUTTLE RAIL MEDIUM	00	23	1.000	C
147921	TRANSPARENT COVER MEDIUM	00	24	1.000	C
148286	UPPER FRONT MEDIUM ORTHO	00	25	1.000	C
148282	TOP COVER MEDIUM ORTHO	00	26	1.000	C
220143	HOUSING PANELS BOX LARGE	00	27	1.000	
255525	LABEL EXP. PARTS MLFAME	01	28	3.000	
255529	LABEL 3-WEGVERPACKUNG	00	29	3.000	
409200	U-SCHEIBE M3 DIN9021B	00	30	2.000	
281153	STERIL-FILTER	00	31	1.000	V
148358	VENTING TUBING	00	32	1.000	V
622049	PACK.LIST EXPANSION ORTHO SUM.	00	33	1.000	
146373	SUBSTITUTE PLUG	00	40	1.000	Z
147878	WASTE TUBING	00	41	1.000	Z

EXPANSION FROM 16/20 TO 24/30 (P/N 148 318) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147788	INKUBATOR MODULE RAW	01	1	1.000	B
147818	WASHER/DISP.MODULE RAW	01	2	1.000	B
147496	SHIPMENT SAFETY BRACKET	00	4	1.000	Z
148291	LOWER FRONT PANEL LARGE ORTHO	00	5	1.000	C
147925	BRACKET 3	00	6	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	7	8.000	
148292	W/D DRAWER FRONT ORTHO	00	8	1.000	C
147926	DRAWER BRACKET	00	9	1.000	
146302	CABLE W60	00	10	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	11	1.000	Z
147624	WASH FLUID CONTAINER	03	12	4.000	Z
148335	WASTE CAP	00	13	1.000	Z
147930	REAGENT CONTAINER SET	01	14	1.000	Z
147931	DISPOSABLE SYRINGE SET	01	15	1.000	V
147934	CONNECTION TUBING TO EXT.P.ST.	00	16	1.000	V
147936	CLEANING SET MANIFOLD	00	17	1.000	Z
281107	WASTE CONTAINER	00	18	1.000	Z
220161	MODULE PALLET	00	19	2.000	
220162	MODULE BOX	00	20	2.000	
220160	CARDBOARD TOP MODULE	00	21	2.000	
220159	FOAM TOP MODULE	00	22	2.000	
220158	BLANKING FOAM	00	23	2.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
220156	BAG	00	24	2.000	
220165	EXP. SHIP. KIT PACKAGING	00	25	1.000	
147610	MAIN SHUTTLE RAIL LARGE	00	26	1.000	C
147922	TRANSPARENT COVER LARGE	00	27	1.000	C
148287	UPPER FRONT LARGE ORTHO	00	28	1.000	C
148284	TOP COVER LARGE ORTHO	00	29	1.000	C
220143	HOUSING PANELS BOX LARGE	00	30	1.000	
255525	LABEL EXP. PARTS MLFAME	01	31	4.000	
255529	LABEL 3-WEGVERPACKUNG	00	32	4.000	
409200	U-SCHEIBE M3 DIN9021B	00	33	2.000	
281153	STERIL-FILTER	00	34	1.000	V
148358	VENTING TUBING	00	35	1.000	V
622049	PACK.LIST EXPANSION ORTHO SUM.	00	36	1.000	
146373	SUBSTITUTE PLUG	00	40	1.000	Z
147878	WASTE TUBING	00	41	1.000	Z

EXPANSION FROM 16/30 TO 24/30 (P/N 148 319) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147818	WASHER/DISP.MODULE RAW	01	2	1.000	B
147496	SHIPMENT SAFETY BRACKET	00	3	1.000	Z
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	4	4.000	
148292	W/D DRAWER FRONT ORTHO	00	5	1.000	C
147926	DRAWER BRACKET	00	6	1.000	
146302	CABLE W60	00	7	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	8	1.000	Z
147624	WASH FLUID CONTAINER	03	9	4.000	Z
148335	WASTE CAP	00	10	1.000	Z
147930	REAGENT CONTAINER SET	01	11	1.000	Z
147931	DISPOSABLE SYRINGE SET	01	12	1.000	V
147934	CONNECTION TUBING TO EXT.P.ST.	00	13	1.000	V
147936	CLEANING SET MANIFOLD	00	14	1.000	Z
281107	WASTE CONTAINER	00	15	1.000	Z
220161	MODULE PALLET	00	16	1.000	
220162	MODULE BOX	00	17	1.000	
220160	CARDBOARD TOP MODULE	00	18	1.000	
220159	FOAM TOP MODULE	00	19	1.000	
220158	BLANKING FOAM	00	20	1.000	
220156	BAG	00	21	1.000	
220165	EXP. SHIP. KIT PACKAGING	00	22	0.000	
147610	MAIN SHUTTLE RAIL LARGE	00	23	1.000	C
147922	TRANSPARENT COVER LARGE	00	24	1.000	C
148287	UPPER FRONT LARGE ORTHO	00	25	1.000	C
148284	TOP COVER LARGE ORTHO	00	26	1.000	C
220143	HOUSING PANELS BOX LARGE	00	27	1.000	
255525	LABEL EXP. PARTS MLFAME	01	28	3.000	
255529	LABEL 3-WEGVERPACKUNG	00	29	3.000	
409200	U-SCHEIBE M3 DIN9021B	00	30	2.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
281153	STERIL-FILTER	00	31	1.000	V
148358	VENTING TUBING	00	32	1.000	V
622049	PACK.LIST EXPANSION ORTHO SUM.	00	33	1.000	
146373	SUBSTITUTE PLUG	00	40	1.000	Z
147878	WASTE TUBING	00	41	1.000	Z

EXPANSION FROM 24/20 TO 24/30 (P/N 148 320) REV: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147788	INKUBATOR MODULE RAW	01	1	1.000	B
148291	LOWER FRONT PANEL LARGE ORTHO	00	2	1.000	C
147925	BRACKET 3	00	3	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	4	4.000	
220161	MODULE PALLET	00	5	1.000	
220162	MODULE BOX	00	6	1.000	
220160	CARDBOARD TOP MODULE	00	7	1.000	
220159	FOAM TOP MODULE	00	8	1.000	
220158	BLANKING FOAM	00	9	1.000	
220156	BAG	00	10	1.000	
255525	LABEL EXP. PARTS MLFAME	01	11	2.000	
147610	MAIN SHUTTLE RAIL LARGE	00	12	1.000	C
147922	TRANSPARENT COVER LARGE	00	13	1.000	C
148287	UPPER FRONT LARGE ORTHO	00	14	1.000	C
148284	TOP COVER LARGE ORTHO	00	15	1.000	C
220143	HOUSING PANELS BOX LARGE	00	16	1.000	
255529	LABEL 3-WEGVERPACKUNG	00	17	2.000	
622049	PACK.LIST EXPANSION ORTHO SUM.	00	18	1.000	

1.1.3.3.9 Shipping Kits

Additional Shipping Kits may be ordered upon request.

PART: 146050

SHIPPING KIT 16/20 OR 16/30 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
220127	SHIPPING KIT PACKAGING	00	1	1.000	
146302	CABLE W60	00	2	1.000	Z
281153	STERIL-FILTER	00	3	1.000	V
146385	CABLE P14	00	4	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	5	2.000	Z
147670	HEIGHT MOVER TOOL	00	6	1.000	Z
147677	PLATEFORK	00	7	1.000	Z
148358	VENTING TUBING	00	8	1.000	V
147930	REAGENT CONTAINER SET	01	9	2.000	Z
147931	DISPOSABLE SYRINGE SET	01	10	2.000	V
147933	REAGENT BAR CODE LABEL SET	00	11	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	12	1.000	V
147935	MTP-TRANSPORTER	00	13	1.000	Z
147936	CLEANING SET MANIFOLD	00	14	1.000	Z
148163	CALIBRATION BOLT	00	15	1.000	T
148245	SETSCREW	00	16	2.000	A
148333	SPILLAGE TRAY	00	17	1.000	Z
148337	WASH FLUID CONT. STAND	00	18	1.000	Z
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	19	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	20	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	21	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	22	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	23	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	24	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	25	1.000	Z
239021	RCKSPIEGEL D= 24 L= 165	00	26	1.000	Z
369064	BATTERIE MN 2400 LR 03 1.5V	00	27	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	28	2.000	
622045	PACK. LIST SHIPPING KIT	01	29	1.000	
255653	LABEL WARNING PC	00	30	2.000	
279403	MICRO WELL PLATTE	00	31	2.000	Z

PART: 146051

SHIPPING KIT 24/20 OR 24/30 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
220127	SHIPPING KIT PACKAGING	00	1	1.000	
146302	CABLE W60	00	2	2.000	Z
281153	STERIL-FILTER	00	3	2.000	V
146385	CABLE P14	00	4	1.000	Z
147179	REAGENT CONTAINER CARROUSEL	00	5	3.000	Z
147670	HEIGHT MOVER TOOL	00	6	1.000	Z
147677	PLATEFORK	00	7	1.000	Z
148358	VENTING TUBING	00	8	2.000	V
147930	REAGENT CONTAINER SET	01	9	3.000	Z
147931	DISPOSABLE SYRINGE SET	01	10	3.000	V
147933	REAGENT BAR CODE LABEL SET	00	11	1.000	Z
147934	CONNECTION TUBING TO EXT.P.ST.	00	12	2.000	V
147935	MTP-TRANSPORTER	00	13	1.000	Z
147936	CLEANING SET MANIFOLD	00	14	2.000	Z
148163	CALIBRATION BOLT	00	15	1.000	T
148245	SETSCREW	00	16	2.000	A
148333	SPILLAGE TRAY	00	17	1.000	Z
148337	WASH FLUID CONT. STAND	00	18	1.000	Z
239002	STIFTSCHL. 6-KT DIN911 SW 2,5	00	19	1.000	Z
239003	STIFTSCHL. 6-KT DIN911 SW 3	00	20	1.000	Z
239010	STIFTSCHL. 6-KT M.GRIFF SW 3	00	21	1.000	Z
239012	STIFTSCHL. 6-KT M.GRIFF SW 2,5	00	22	1.000	Z
239015	KUNSSTOFF-SCHIEBLEHRE WEISS	00	23	1.000	Z
239017	PINZETTE L: 140 - 160 MM	00	24	1.000	Z
239020	CLIPS TASCHENLAMPE LECLANCHE	01	25	1.000	Z
239021	RCKSPIEGEL D= 24 L= 165	00	26	1.000	Z
369064	BATTERIE MN 2400 LR 03 1.5V	00	27	2.000	V
400309	ZYL-SCHR.M 4X25 DIN912 A2	00	28	2.000	
622046	PACK. LIST SHIPPING KIT	01	29	1.000	
255653	LABEL WARNING PC	00	30	2.000	
279403	MICRO WELL PLATTE	00	31	2.000	Z

1.1.4 Microlab F.A.M.E. Installation

ATTENTION
The initial installation and setup of the Microlab F.A.M.E. may only be carried out by an authorized Service Technician.

For proper installation follow the order of instructions given in this section.

Refer to User Manual chapter 11 for general technical specifications.

1.1.4.1 Workplace environment

Microlab F.A.M.E. is an instrument which pipettes reagents and different solutions for temperature-dependent analysis. Therefore, it is important to choose a location in the laboratory where the instrument will not be exposed to unusual temperature variations such as near a window, heating duct, or air-conditioning duct.

Required ambient temperature range:	15°C - 35°C 60°F - 95°F

Microlab F.A.M.E. should be placed on a firm, clean, and level surface. The influence of dust, solvents, and acid fumes must be minimized in the workplace environment.

Depending on the configuration, the instrument weighs between 220 kg and 302 kg (485 lbs. and 666 lbs.). The instrument must be placed on a table or workbench capable of supporting the following weights.

F.A.M.E. Configuration	Weight	Minimum space needed (excluding PC)
16/20	220 kg 485 lbs.	1800 x 810 mm 5’ 11” x 2’ 8”
16/30	250 kg 550 lbs.	2000 x 810 mm 6’ 7” x 2’ 8”
24/20	272 kg 600 lbs.	2000 x 810 mm 6’ 7” x 2’ 8”
24/30	302 kg 666 lbs.	2250 x 810 mm 7’ 5” x 2’ 8”

Space is required under the instrument for waste container storage. Make provision for the drain hose which connects the washer/dispenser module to the waste container.

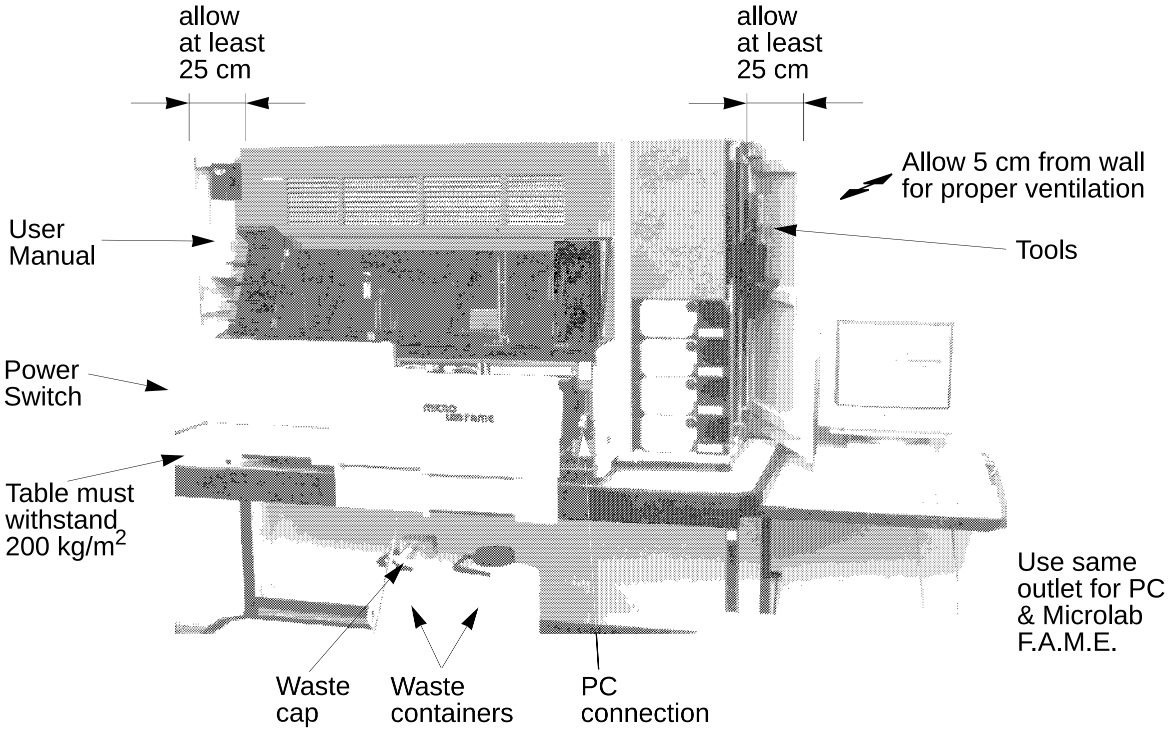
Access to the mains connector and the ON/OFF switch (located on the lower left side of the instrument) should not be hindered.

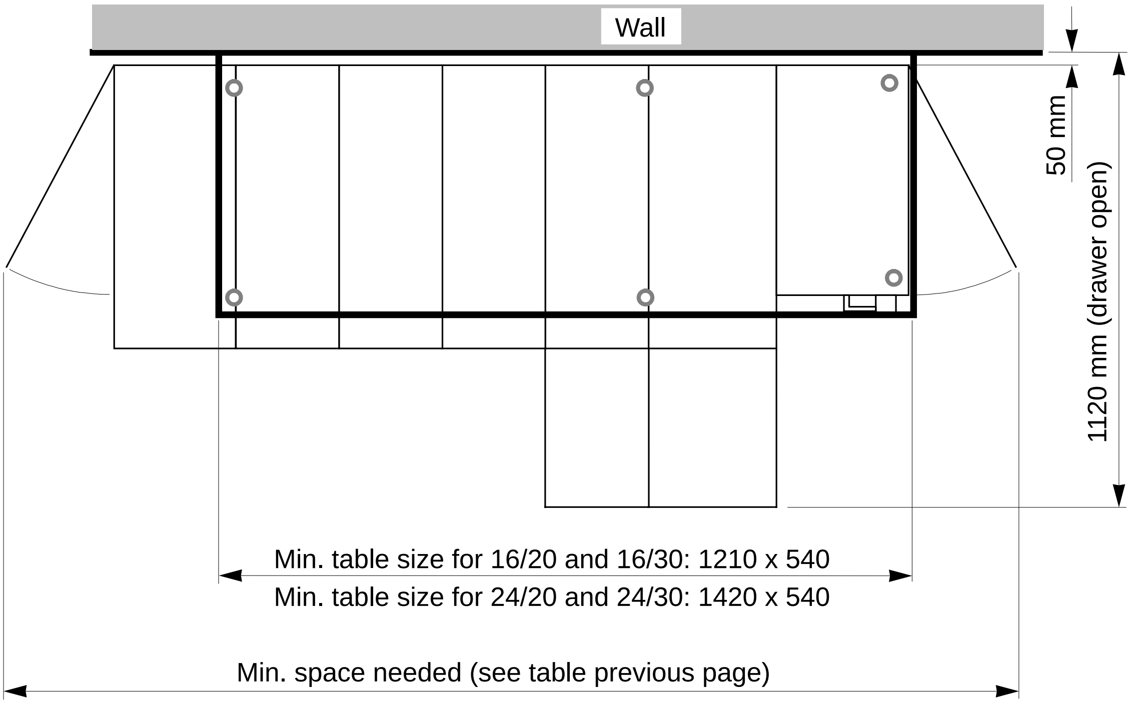
The instrument should be located within easy reach of a standard electrical outlet (1 socket for the instrument, 1 for the computer, 1 for the monitor and 1 for the (optional) printer).

We recommend using a Uninterruptable Power Supply (UPS). See User Manual Section 11.1.1.

Workplace Environment

Ambient Temperature 15° - 35°C


allow
at least
25 cm
allow
at least
25 cm
Allow 5 cm from wall
for proper ventilation
User
Manual
Tools
Power
Switch
Table must
withstand
200 kg/m²
Use same
outlet for PC
& Microlab
F.A.M.E.
Waste
cap
Waste
containers
PC
connection

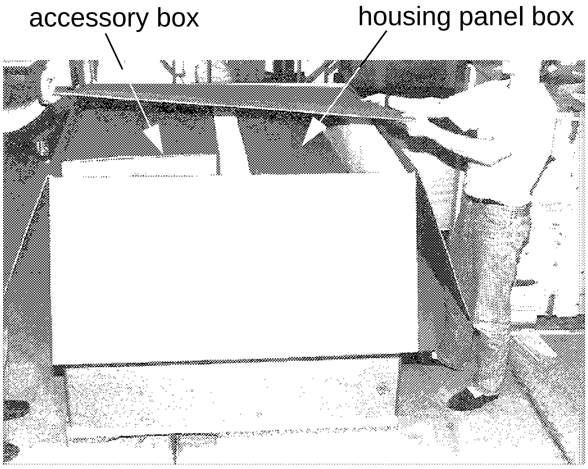

Wall
50 mm
1120 mm (drawer open)
Min. table size for 16/20 and 16/30: 1210 x 540
Min. table size for 24/20 and 24/30: 1420 x 540
Min. space needed (see table previous page)

1.1.4.2 Unpacking Microlab F.A.M.E.

ATTENTION
Carefully store the Microlab F.A.M.E. packing material for future shipping of the instrument.

Open the box and remove the cardboard top.

Remove accessory box, housing panel box, and protective inserts.



Remove the instrument chassis.

Level the chassis by adjusting the chassis feet and align the chassis so that it does not have to be moved once the modules are mounted (assembled instrument is very heavy!!!).

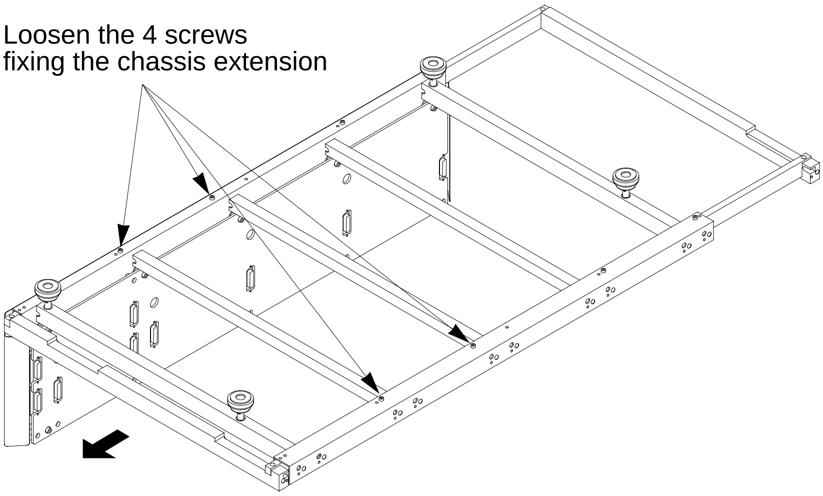
Leave at least 5 cm space between the instrument and the wall for proper ventilation.

Other considerations include operator comfort and easy access to related supplies and equipment. For operator convenience, the front edge of the instrument should be near to the front of the bench. Finally, the position of the instrument must not hinder operation or accessibility of other equipment in the work area.

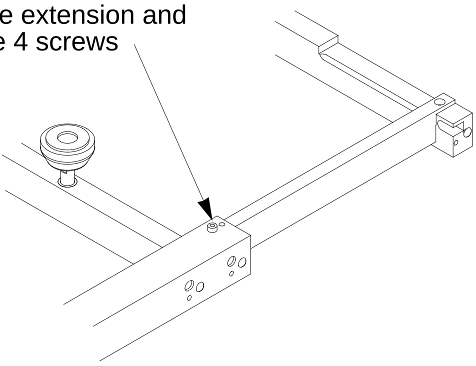
Adjust chassis to instrument configuration

Turn chassis upside down.

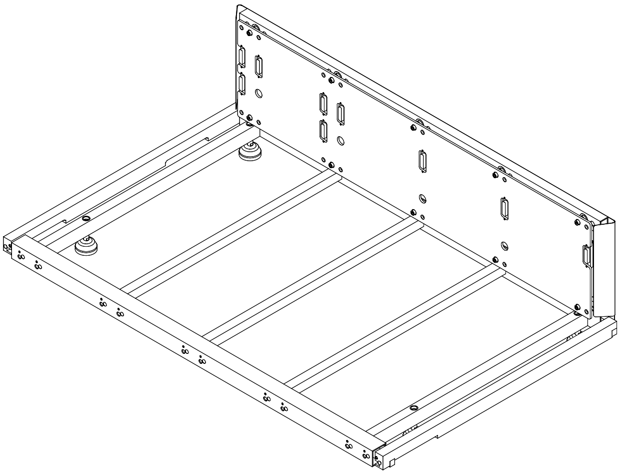
Loosen the 4 screws
fixing the chassis extension



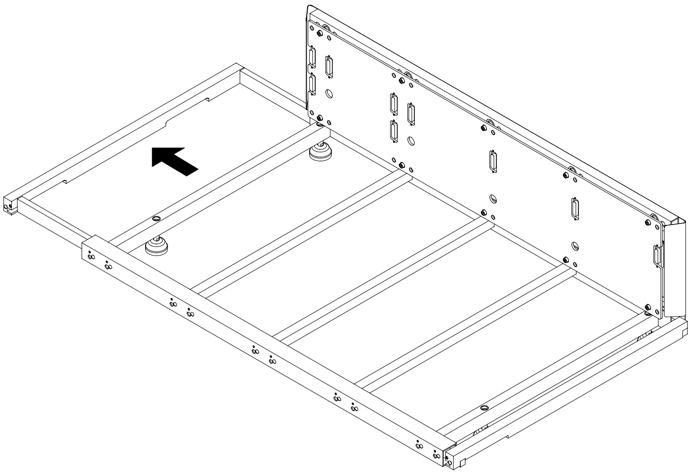
Pull out the extension and
fix with the 4 screws



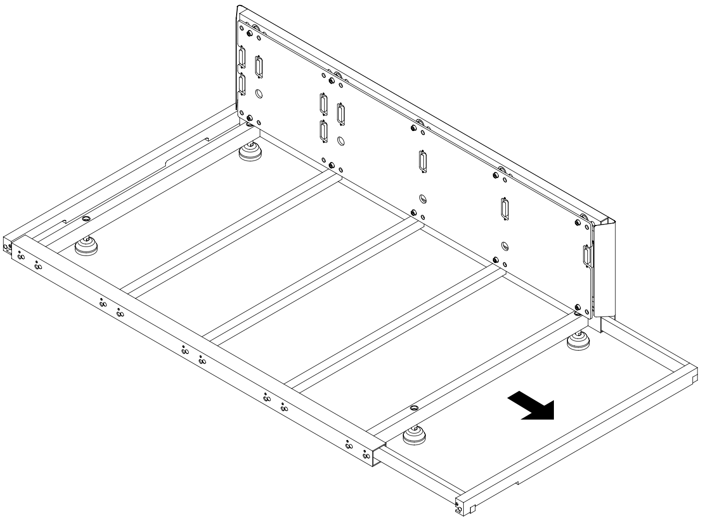
Chassis configuration16/20



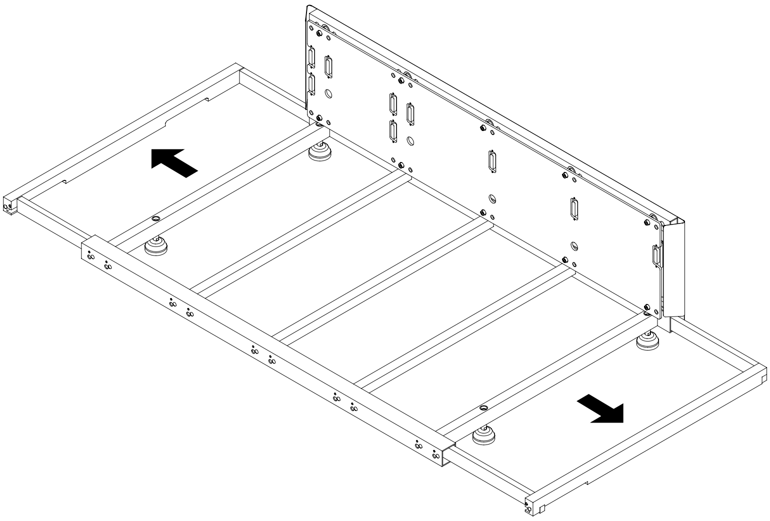
Chassis configuration 16/30



Chassis configuration 24/20



Chassis configuration 24/30



1.1.4.3 Instrument assembly

ATTENTION
Install central modules first!

❐ The following installation procedure is for a 16/20 instrument configuration.

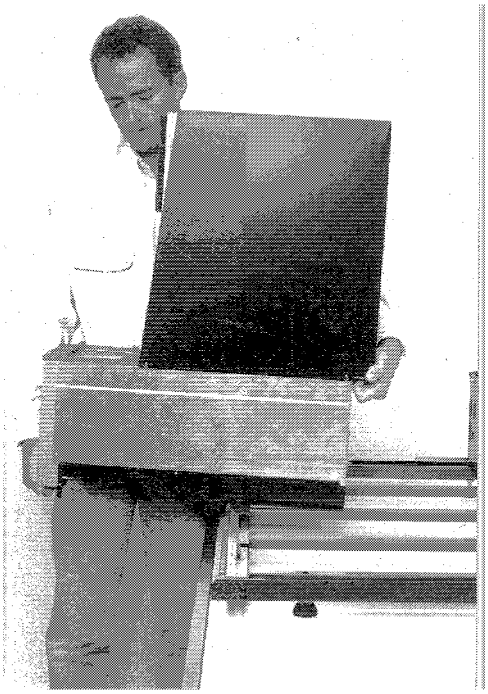
❐ All required tools are in the accessory box.

NOTE
When placing the chassis on the table for module mounting, leave a space of approx. 60 cm (24 inches) to the right of the chassis for the container stack.

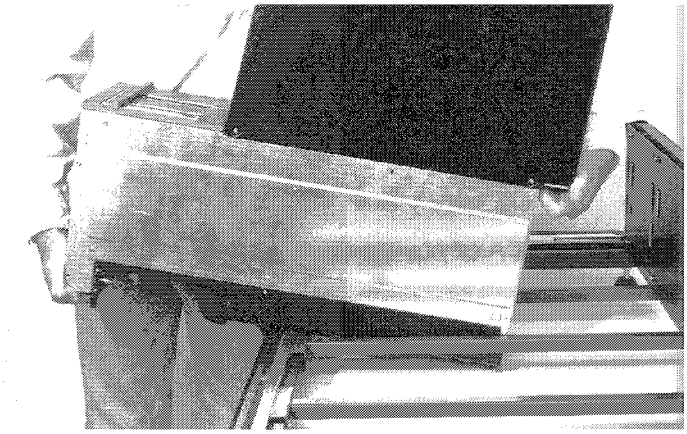
1.1.4.3.1 Installing INCUBATOR Module

Weight: 32 kg (71 lbs.)

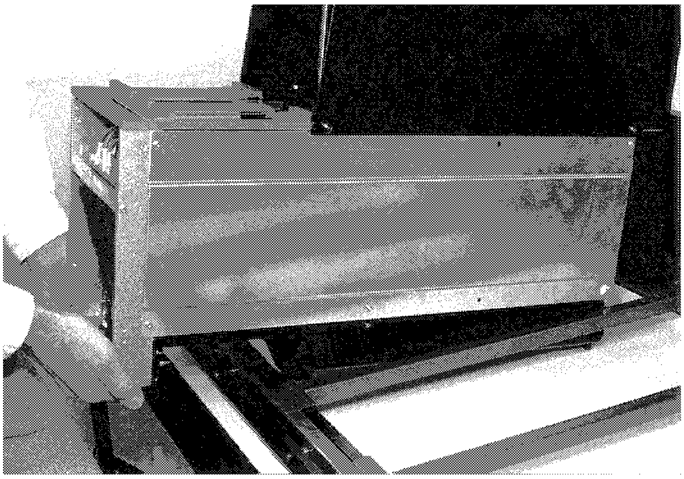
Lift the module as shown in the following picture and set it onto the chassis.



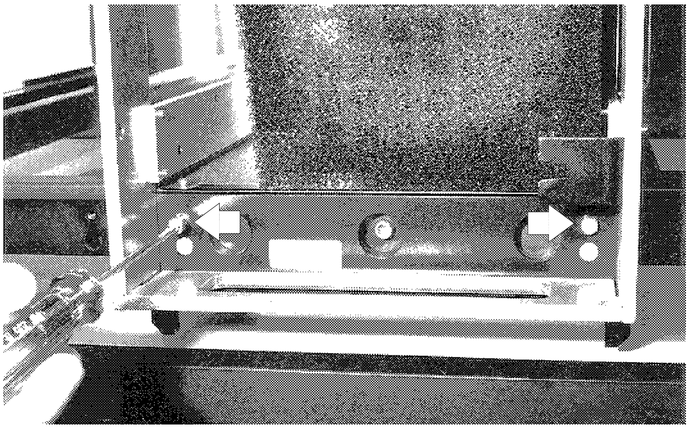
Lower the rear of the module between the corresponding braces.

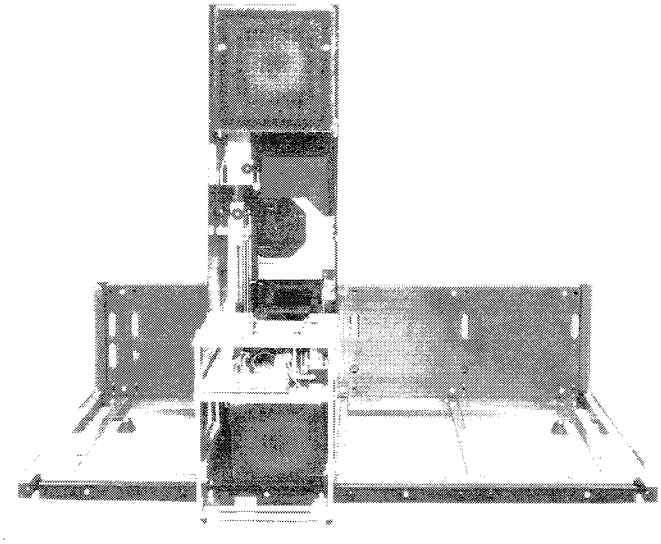


Slightly lift the front of the module and slide it carefully to the rear until the front is level. Do not push the module all the way back until the module is completely level!



Fix the module to the chassis by tightening the two captive screws.

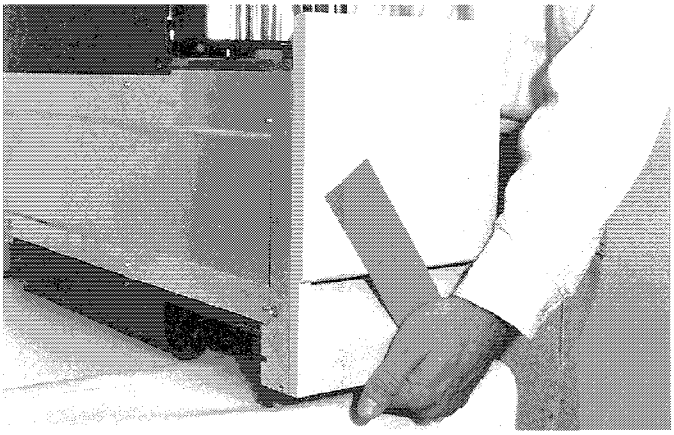




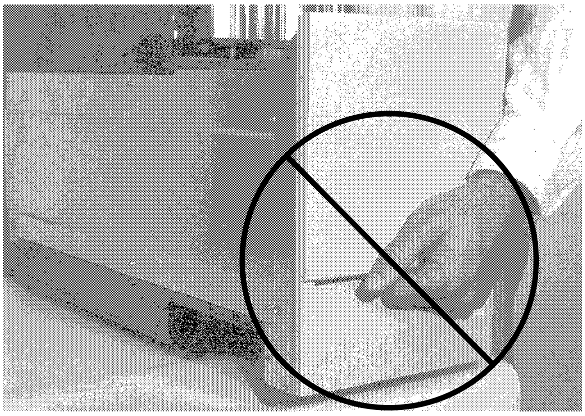
1.1.4.3.2 Installing WASHER/DISPENSER Module

Weight: 35 kg (77 lbs.)

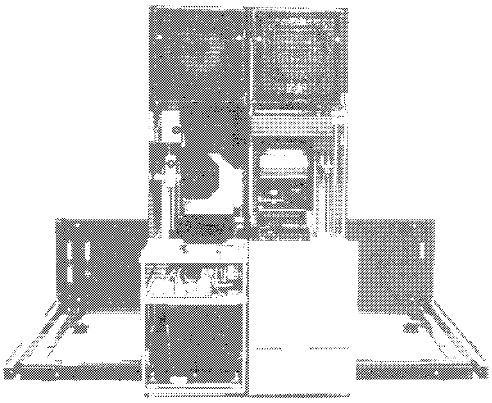
ATTENTION
Never use the drawer handle when lifting the washer/dispenser module or the end module! Use the module-frame handle provided underneath the drawer panel.



correct



incorrect



Using the height mover tool (in accessory box), raise the dispenser arm so the drawer can be opened. Stop at least 2 cm ($^{13}/_{16}$”) before reaching the top.

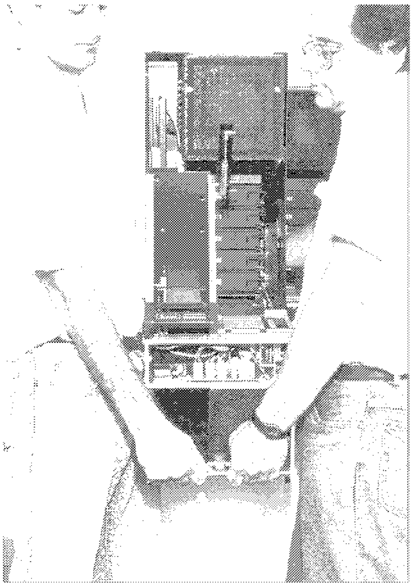
Now proceed as with the incubator module (see section 1.1.4.3.1).

1.1.4.3.3 Installing ENTRY Module

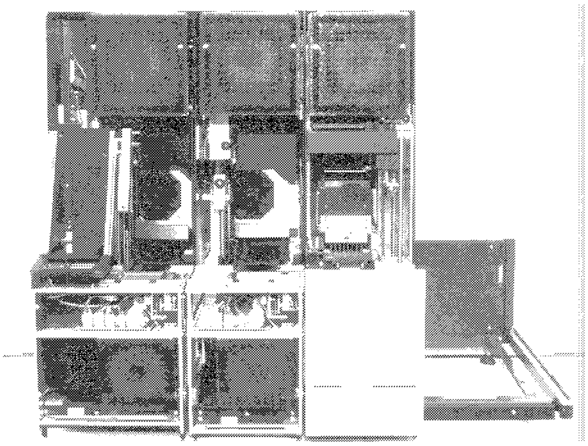
Weight: 60 kg (132 lbs.)

ATTENTION
Two persons are needed to lift the entry module on to the chassis.

ATTENTION
Set the voltage selector switch to the local mains electricity supply voltage.



Now proceed as with the incubator module (see section 1.1.4.3.1)

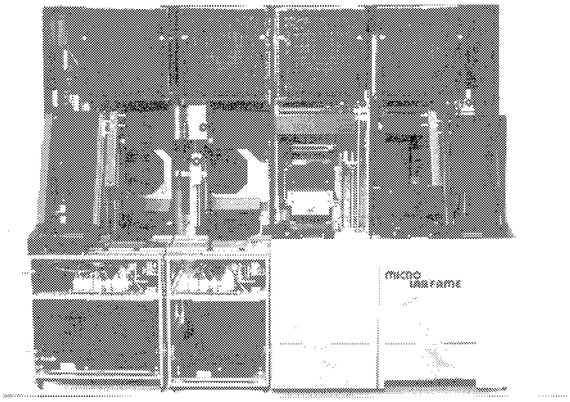


Remove the user manual from the accessory box and store it in the entry module door.

1.1.4.3.4 Installing END Module

Weight: 35 kg (77 lbs.)

ATTENTION
Never use the drawer handle when lifting the End Module! Use the handle provided underneath the drawer panel. See “Installing INCUBATOR Module” on page 74.



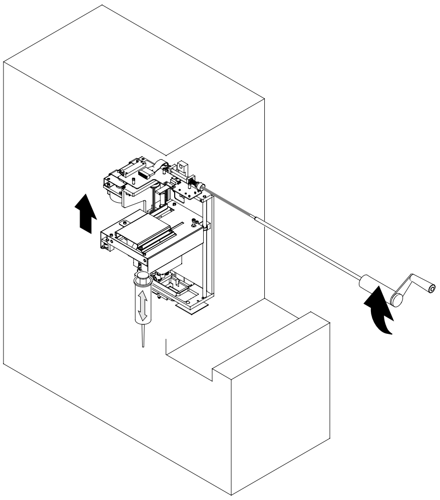
Using the height mover tool, raise the dispenser arm so the drawer can be opened. Stop at least 2 cm ($^{13}/_{16}$”) before reaching the top.

Now proceed as with the incubator module (see section 1.1.4.3.1).

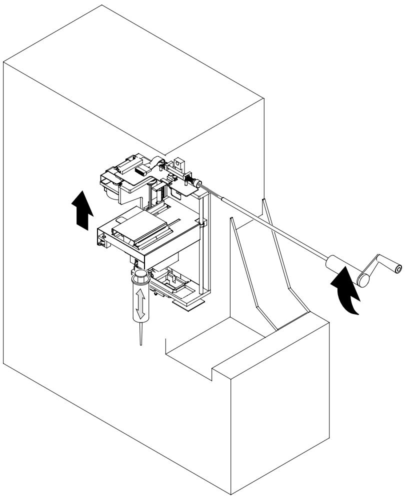
1.1.4.3.5 Installing Main Shuttle Rail & Panels

ATTENTION

Do not attempt to open the reagent drawers without raising the dispensers in the Washer/Dispenser and End Modules. Use the height mover tool (stored in container stack) to raise the dispensers.



Wash/Disp. Module



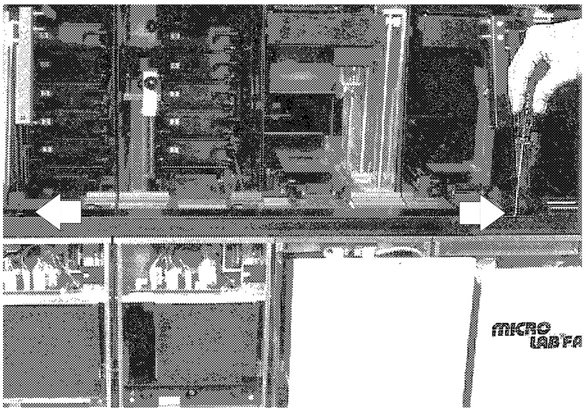
End Module

Main shuttle rail

Open the drawers of the Washer/Dispenser Module and end module.

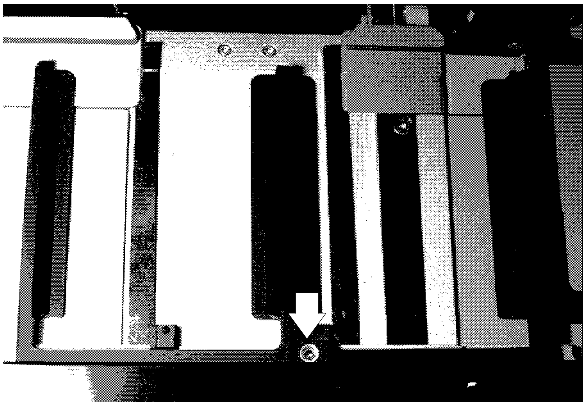
Slide the main shuttle rail towards the instrument into position.

Fix the rail with two screws p/n 400 309.



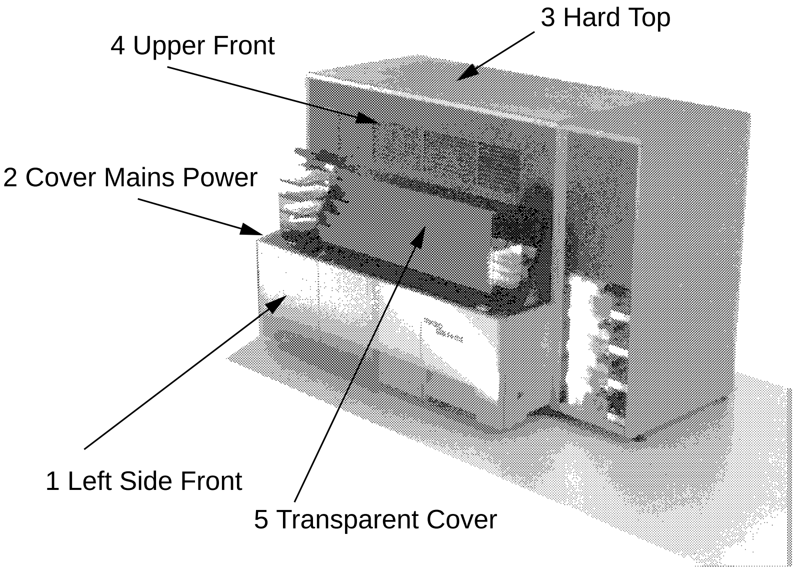
MTP Transporter

The MTP (Micro-Titer Plate) transporter is attached to the main shuttle rail with a screw. Carefully tighten the screw and check for proper fit.



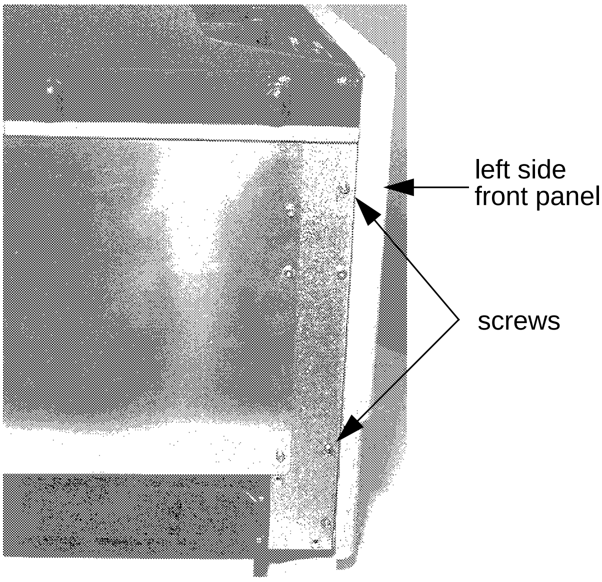
Move the MTP transporter by hand from left to right and check that it slides smoothly.

Installing Housing Panels


3 Hard Top
4 Upper Front
2 Cover Mains Power
1 Left Side Front
5 Transparent Cover

Left Side Front

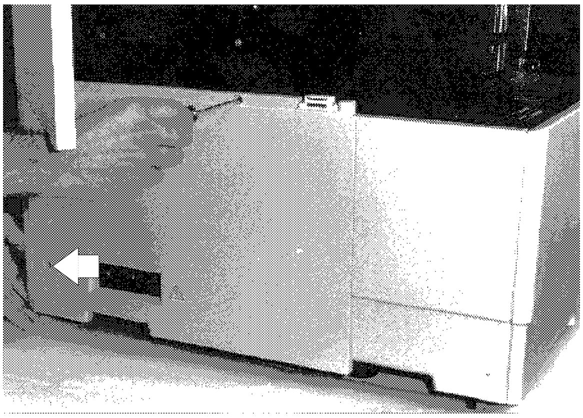
Slide the *left side front* panel from left to right into position -- fasten it with the two screws.


left side
front panel
screws

Cover Mains Power

ATTENTION
Before fitting the Cover Mains Power, check that the voltage selector switch is set to the local mains voltage. If necessary set to the correct position.

Insert the tongue of the *cover mains power* into the groove of the *left side front panel* -- fasten the two mains panel screws.



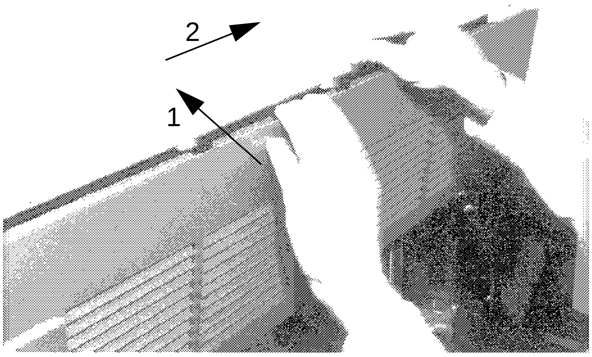
Hardtop

Make sure the front right corner of the *hardtop* and the *strip container stack* fit properly.

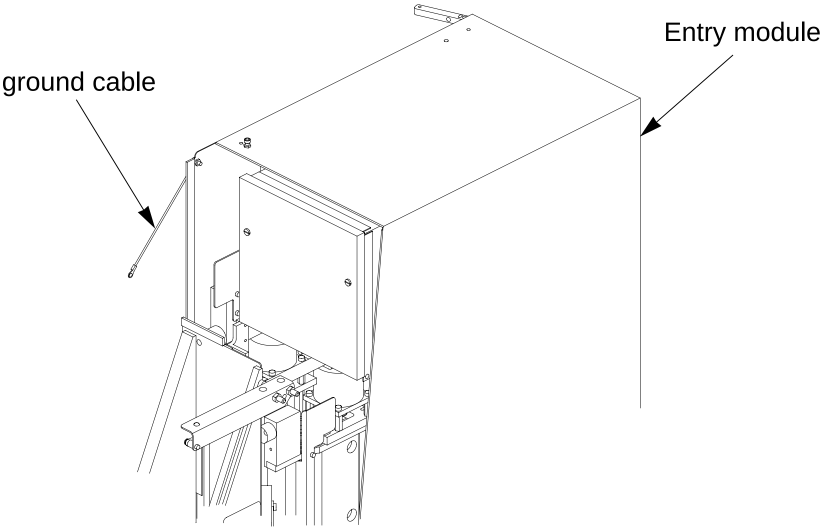
Tighten the three screws on top.

Upper Front

Slightly lift the front edge of the *hardtop*, align the notches, and push the *upper front* under the *hardtop* (1).



Screw ground cable onto Upper Front.

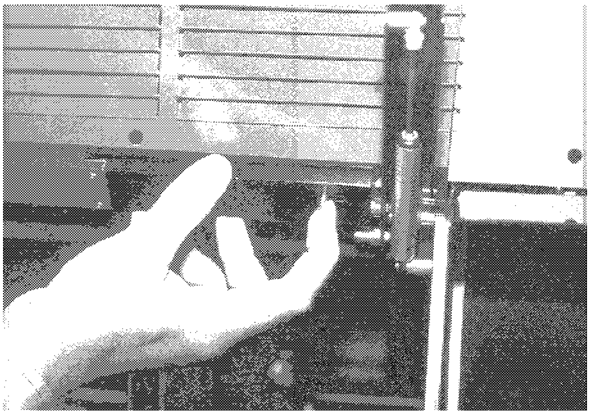

Entry module
ground cable

Slide the *upper front* from left to right into position (2).

Transparent Cover

Lift the two transparent cover dampers to the upper position.

Press in the two locking pins and slide the *transparent cover* downwards into position.

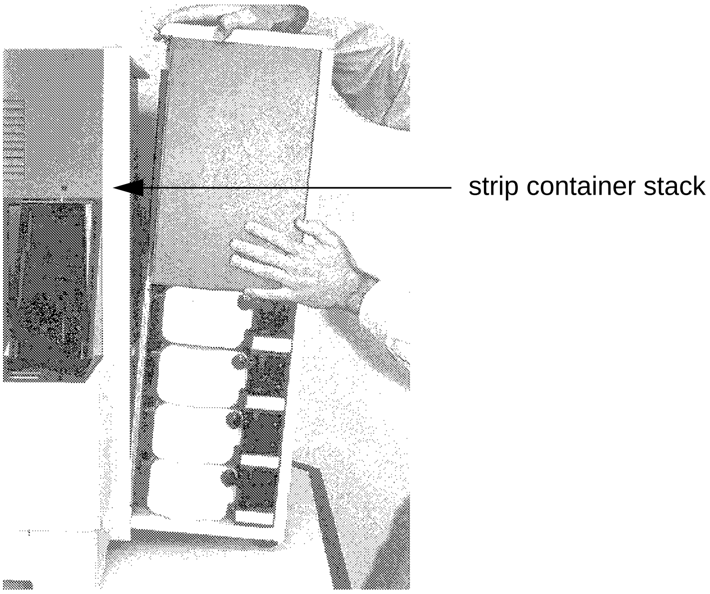


Remove the transparent film from the *transparent cover* as well as the exit stack.

1.1.4.3.6 Installing Container Stack

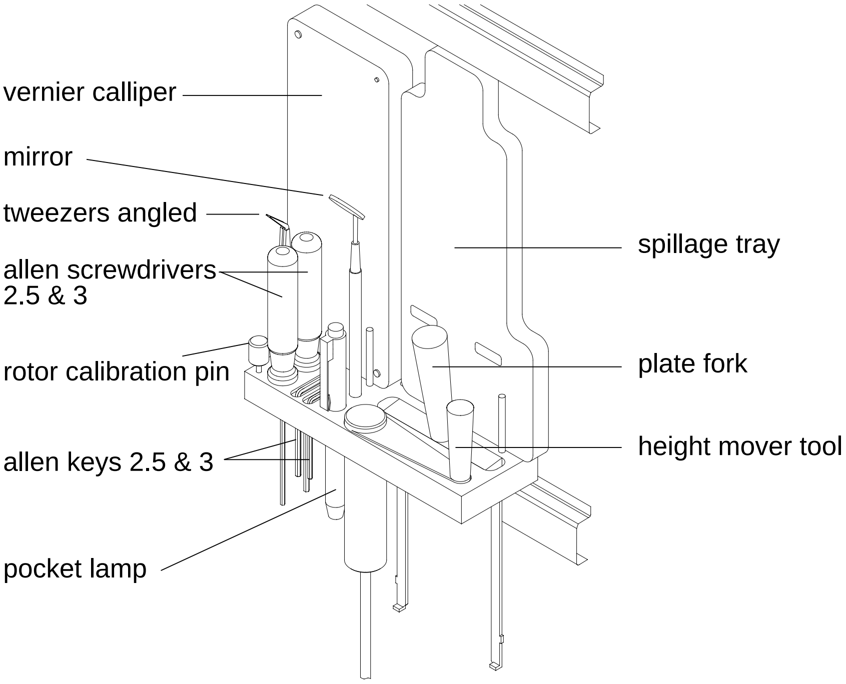
Weight: 24 kg (53 lbs.)

With the *container stack* tilted to the right, align the bottom of the container stack with the *strip container stack*, then carefully push the top of the container stack into position.

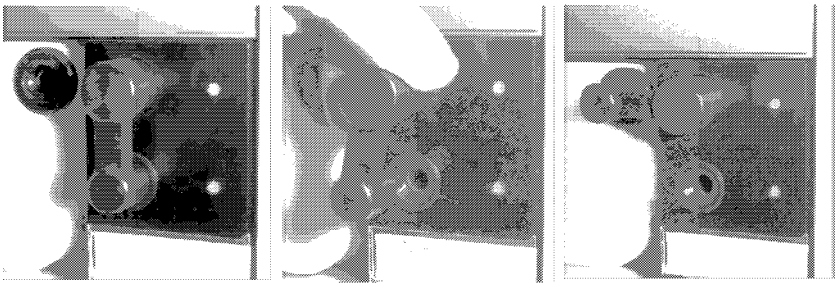

strip container stack

Adjust the container stack height by turning the container stack feet. Check the gaps between the housing panels.

Remove the tools from the accessory box, open the container stack door, and store them in the tool rack as shown below.


vernier calliper
mirror
tweezers angled
allen screwdrivers 2.5 & 3
rotor calibration pin
allen keys 2.5 & 3
pocket lamp
spillage tray
plate fork
height mover tool

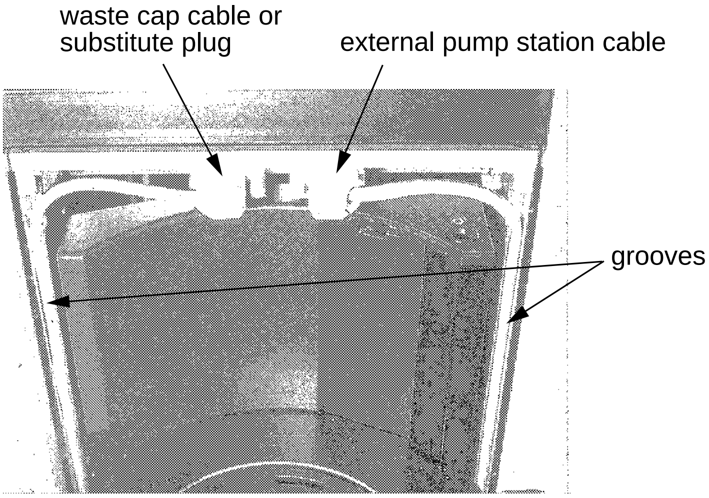
To connect the wash containers, pull out the coupling, turn, and push into the wash container outlet.



1.1.4.3.7 Connecting Tubing and Cables

Open the reagent drawer (washer/dispenser), connect the cables and press them into the grooves.

If the waste cap is not used, substitute plug p/n 146 373 must be inserted in the waste cap socket for proper functioning of the instrument.

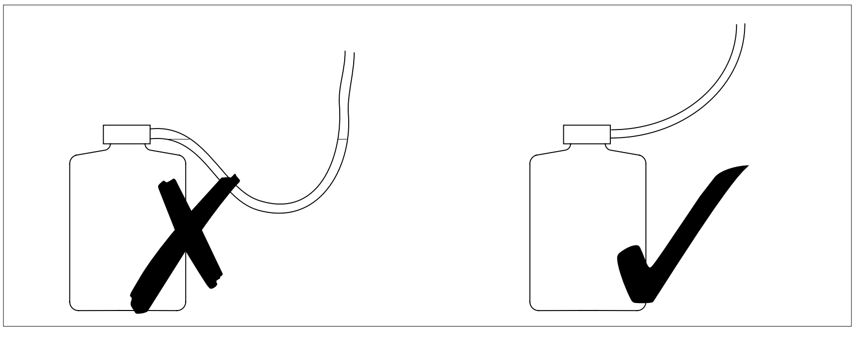

waste cap cable or substitute plug
external pump station cable
grooves

Connect the labeled end of the pump station cable to the external pump station.

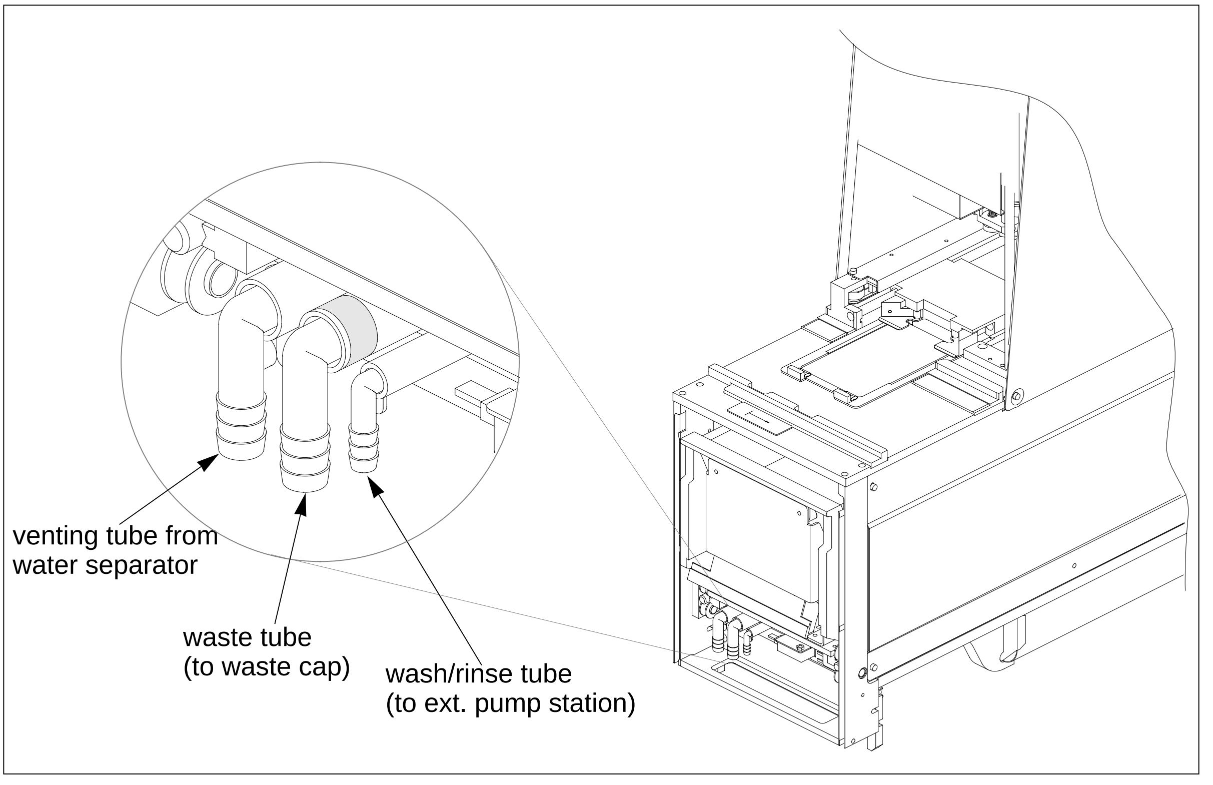
Connect the waste tube to the waste cap. Connect the wash/rinse tube to the external pump station. Cut tubing to the appropriate lengths.

ATTENTION

The waste tube should be routed to the waste container in such a way as to avoid dead volumes of liquid in the tube.

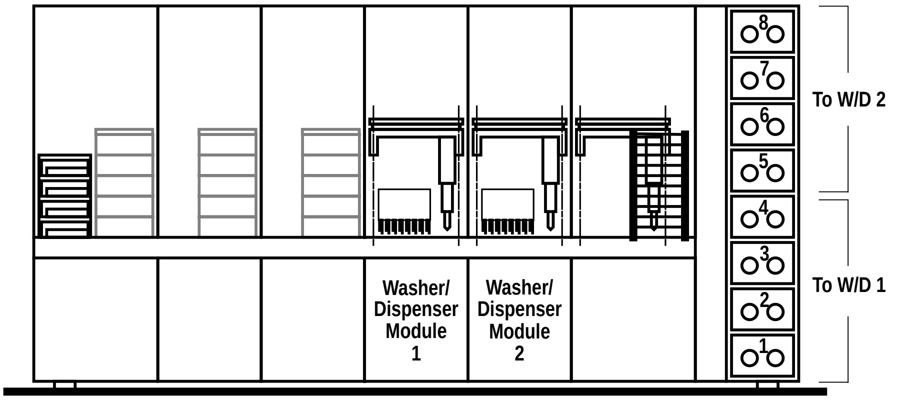


Connect one end of the water separator venting tube to the Washer/ Dispenser Module and the other end to the sterilizing filter. Place the sterilizing filter under the work bench out of the way.

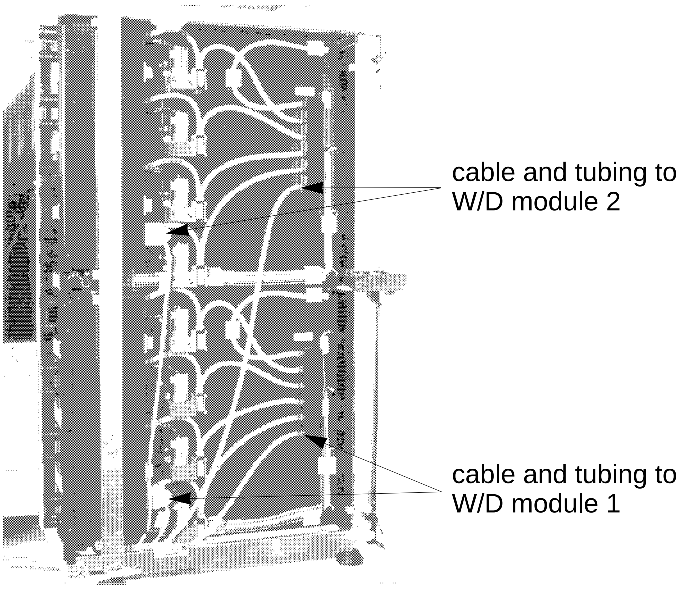

venting tube from
water separator
waste tube
(to waste cap)
wash/rinse tube
(to ext. pump station)

ATTENTION
If two washers are being installed (24/20 or 24/30), pay special attention to the external pump station tubing connections. The lower external pump station connects to washer/dispenser 1. The upper external pump station connects to washer/dispenser 2.

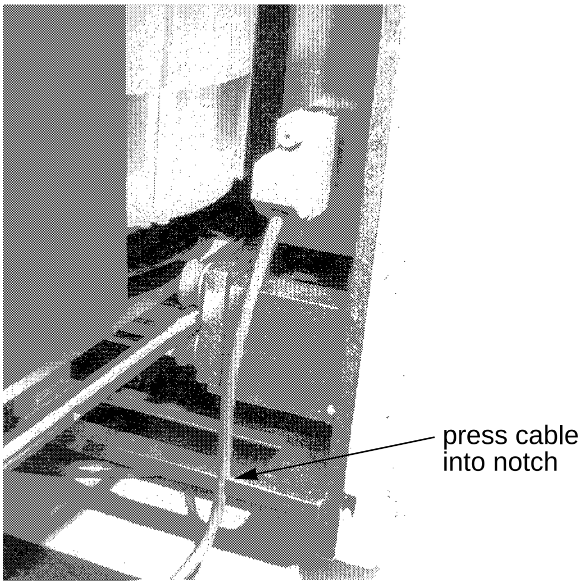
Ensure that tubings are neither twisted nor kinked.


8
7
6
5
4
3
2
1
To W/D 2
To W/D 1
Washer/ Dispenser Module 1
Washer/ Dispenser Module 2

Install cables and tubing as shown below:


cable and tubing to
W/D module 2
cable and tubing to
W/D module 1

Open the End Module drawer and connect the computer cable (RS 232) p/n 146 385.


press cable
into notch

Connect the other end of the computer cable to the corresponding serial interface (RS 232) on your personal computer.

ATTENTION
Before continuing, check all connections! Incorrectly fitted cables may result in damage to either the instrument or PC.

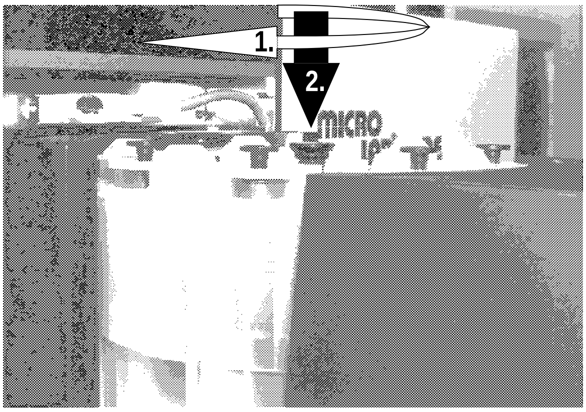
1.1.4.3.8 Installing Reagent Container Carousel

ATTENTION
Installing the reagent carousel improperly will lead to syringe breakage or reagent spillage!

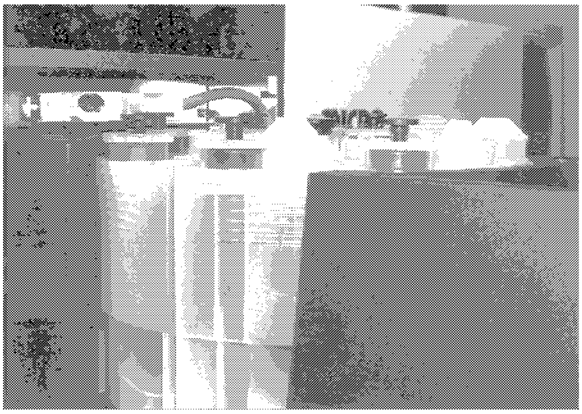
Remove the reagent container carousel, reagent containers, and syringes from the accessory box. For setting up the reagent carousel refer to User Manual section 5.9.

Open the reagent drawers of the washer/dispenser module and the end module. Lower and turn the reagent container carousel carefully until it drops into position.

Carousel installed CORRECTLY.



Carousel installed INCORRECTLY.



1.1.4.3.9 Computer Installation

ATTENTION
Before either

- ❐ *connecting the computer to the instrument for the first time*
- ❐ *connecting a different computer to the instrument or*
- ❐ *connecting another instrument to the existing computer*

always check that the photometer filter presettings in the software correspond to the filters actually installed in the instrument.

The computer system consists of:

- ❐ monitor
- ❐ keyboard
- ❐ PC unit with 3$^{1}/_{2}$” disk drive and harddisk
- ❐ mouse

Installing the Computer System

Consult the manufacturers installation instructions for the installation of the monitor, keyboard, PC unit and the mouse.

Stick the label shown below in a clearly visible place on the computer.

- **PC erst ausschalten, wenn OS/2 “shut down” ausgeführt worden ist.**
- **Während eines RUN’s darf die Systemzeit des PC’s nicht verstellt werden.**

- **Shut down OS/2 before switching off PC.**
- **Do not change the OS/2 system time during a run.**

- **Arrêter l’ordinateur seulement après l’exécution du OS/2 “shut down”.**
- **Ne pas modifier l’heure du system OS/2 pendent un RUN.**

Lable warning PC p/n 255 653

1.1.4.3.10 Electrical Installation

We recommend using a Uninterruptable Power Supply (UPS). See User Manual Section 11.1.1.

Power

- The mains plug is on the left-hand side of the instrument towards the rear.
- The fuses for the instrument are situated next to the mains socket on the left-hand side of the instrument (remove cover mains power).
- Plug in the mains cables for the computer and the instrument into the same electrical outlet.

Changing the Voltage

ATTENTION
Set the instrument voltage selector switch (230/115V) to the local mains voltage supply before switching the instrument on.

1.1.4.3.11 Software Installation

See User Manual Section ‘Software Installation’.

1.1.4.3.12 Login and Access

When installing the instrument start the system as follows:

Open an OS/2 window.

Type `fame /s`.

When the Instrument - List appears select the port to which the instrument is connected and click OK.

NOTE
Starting up the system in this way only allows you to use ‘Services’. No RUNs can be executed.

The login box appears. Log in as a System Manager:

- ❐ **User Name** Type: `system manager`
- ❐ **Password** Type: `six` (an asterisk appears in place of each character typed).

Click **OK**.

Now create the Service Technician’s access rights. Proceed as follows:

Select **Access...** from the **Services** menu in the main F.A.M.E. window. The Access-Setup window will appear.

Select **New user...** from the **User** menu. A dialog box will appear in which to define the Service Technician’s access rights.

The following entry fields will appear for you to fill in:

- ❐ **User Name** Type: `serv`
- ❐ **Comment** (leave empty).
- ❐ **Password** Type: `tech` (an asterisk appears in place of each character typed).
- ❐ **Confirm Password** Type: `tech` (an asterisk appears in place of each character typed).
- ❐ **Abbreviation** (leave empty).
- ❐ **Access level** Type: `6`

Click **OK**.

NOTE
The user name and password are not case sensitive.

Logging in the future is simply done with the user name `serv` and the password `tech`.

1.1.4.3.13 System Start-up and Shut-down

For the normal User Start-up Procedure see User Manual Section ‘System Start-up and Shut-down’.

1.1.4.3.14 Downloading Firmware to Instrument

NOTE
A firmware download should only be performed by a qualified Service Technician.

It may be necessary from time to time to download new firmware to the instrument. The procedure for doing this is as follows:

Insert the F.A.M.E. Firmware diskette in the $3^{1}/_{2}$” drive.

Open an OS/2 window.

Type **`a:`** followed by enter.

Then type **`fir_inst`** in the OS/2 window you used in the previous section, followed by enter.

A startup message will appear followed by the message:

```
Do you really want to install the versions? Y/N
```

Type **`y`** followed by enter.

When prompted for a drive and path, type **`C:\FAME`** followed by enter (if the F.A.M.E. software is installed on a different drive, specify the appropriate drive instead of C:). The firmware files will then be copied onto the hard disk.

After a successful firmware installation the following message will appear:

```
F.A.M.E. new firmware versions successfully installed.
```

Switch on the instrument.

In the OS/2 window, type **`c:`** followed by enter to go back to the C:\ directory.

Remove the diskette from the $3^{1}/_{2}$” drive.

In the OS/2 window, type **`fame /s`** followed by enter. This will start the F.A.M.E. software required to make the download.

Select the connection port to which the instrument is connected and click **OK**.

When the Login dialog box appears, log into the system with your user name and password and click **OK**.

NOTE
You need level 5 access rights or higher to perform the download.

When the main F.A.M.E. window appears, select **Service and diagnostics...** from the **Services** menu. The Service and Diagnostics window will appear.

ATTENTION
At this point ensure that **Communications** *is* *not* *selected in the* **View** *menu i.e. no tick next to this menu choice, otherwise this will cause a system crash.*

From within the Service and Diagnostics window, select **Download...** from the **Diagnostics** menu. The Download dialog box will then appear.

Click on all check boxes.

Enter your name in the **Enter your name:** entry field (this is for trace purposes only).

After entering your name, the **Start** button will be enabled.

Click on the **Start** button to initiate the download process.

ATTENTION
The **Start** *button must be clicked on with the mouse to start the download. Do* *not* *press enter instead!*

The firmware takes between 30 and 40 minutes to download. During the download process the **Start** button will be disabled (grayed out).

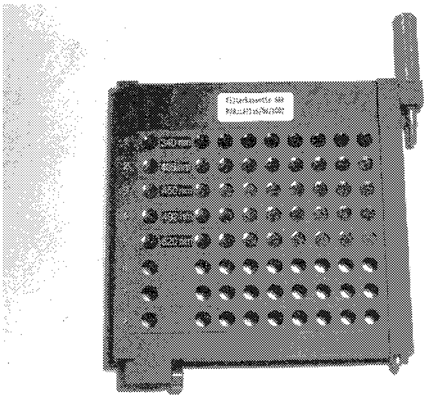
The download is complete when all the check boxes in the dialog have been cleared and the dates in the **last download** column have been updated.

Check that all modules have been updated by looking at the date in the **last download** column. The current date should be displayed in each row of this column.

Click on **Cancel** to exit the Download dialog.

1.1.4.3.15 Installing Filter Case

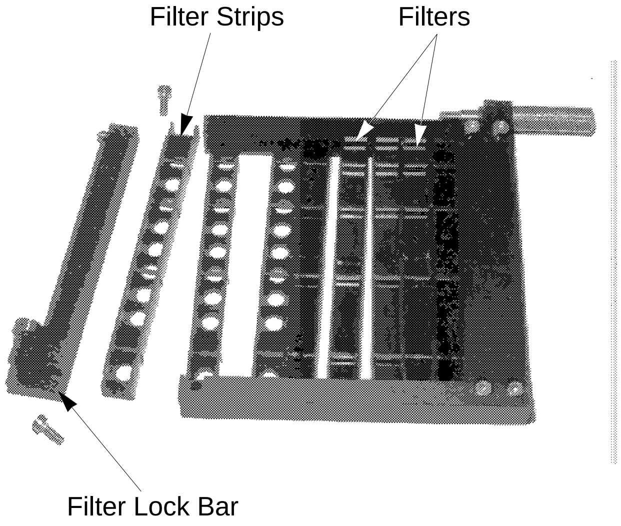
When shipped, the filter case is set up with the following standard filters:



Filter position	Wave lengths
1	340 nm
2	405 nm
3	450 nm
4	492 nm
5	620 nm
6	blank
7	blank
8	blank

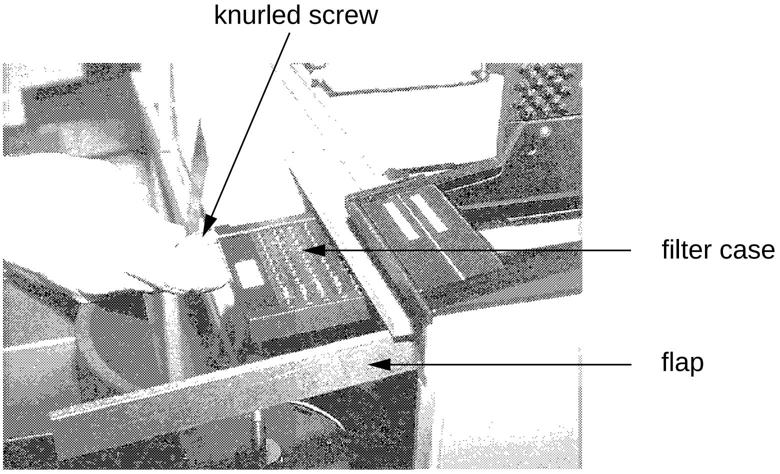
If additional filters have been ordered, they are supplied separately and must be fitted prior to filter case installation.

Unscrew filter lock-bar and add filters in filter positions 6 to 8. For test and verification purposes, the standard filters must remain in positions 1 to 5 in the order shown above. The combined total of filters and filter strips (blanks) must always be eight (8).



ATTENTION
The filters installed must be defined in the software! See User Manual section 9.2.3.

Now install the Filter Case using the macro **FILTERCH.MCR**. Refer to section 1.3.8 on how to run macros.



1.1.4.3.16 Loading Check Plate into Instrument

Use a flat-bottom NUNC plate.

Loading the Check Plate requires a macro to be run.

Install Software as described in User Manual.

Start up the system as described in section 1.1.4.3.12.

Refer to section 1.3.8 on how to run macros.

The macro to run is: **LOADWCHK.MCR**.

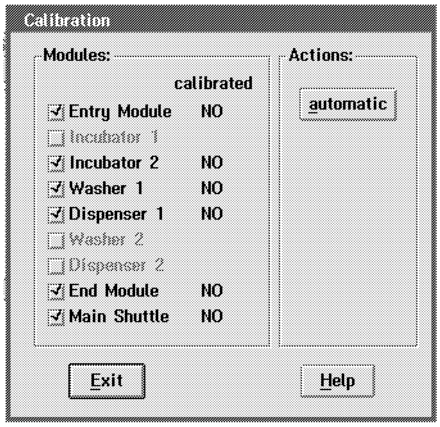
Carefully follow the instructions that appear on the computer screen.

1.1.4.3.17 Instrument Calibration

Select **Service and diagnostics...** from the **Service** menu in the main F.A.M.E. window.

ATTENTION
At this point ensure that **Communications** *is* *not* *selected in the* **View** *menu i.e. no tick next to this menu choice, otherwise this will cause a system crash.*

In the Service and Diagnostics window, select **Calibration...** from the **Diagnostics** menu. The Calibration dialog box will then appear.



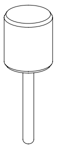
Modules:	calibrated
☑ Entry Module	NO
☐ Incubator 1	
☑ Incubator 2	NO
☑ Washer 1	NO
☑ Dispenser 1	NO
☐ Washer 2	
☐ Dispenser 2	
☑ End Module	NO
☑ Main Shuttle	NO

Click on all check boxes and then click on the **automatic** button.

Follow the instructions that appear on the computer screen.

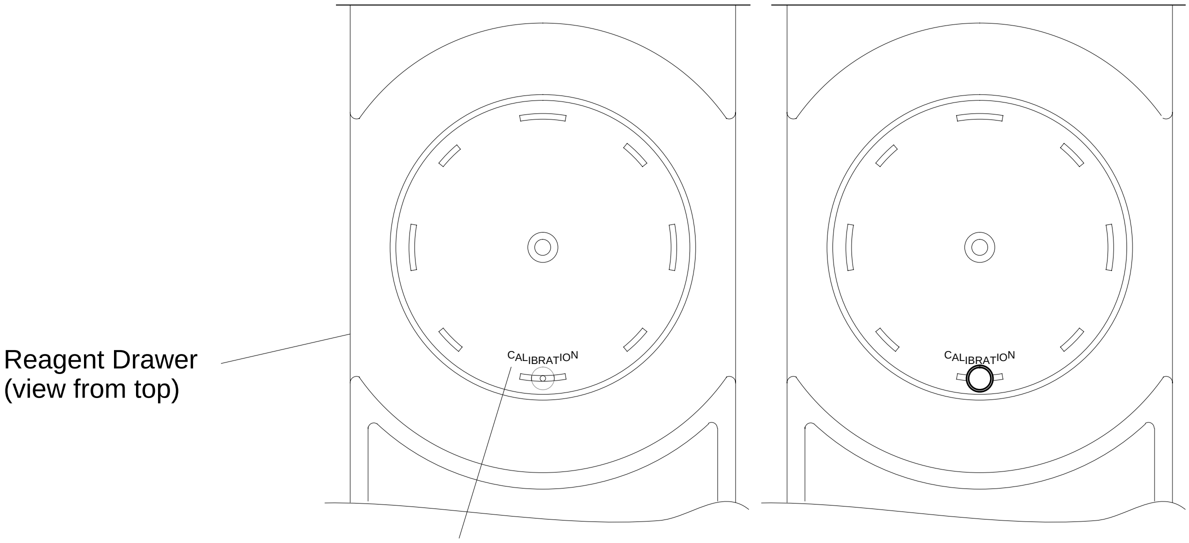
After the calibration procedure has been completed, all modules should be flagged as “YES” in the Calibration dialog box. If any are not, the instrument is not properly calibrated. Rectify fault, if necessary use Diagnostic Master to identify.

Close the Calibration dialog box by clicking on the **Exit** button and then on the **OK** button in the dialog that follows.



Rotor Calibration Pin

During calibration of the washer/dispenser and end modules you will be asked to insert the rotor calibration pin into a slot in the reagent rotor. The following figure shows the correct insertion of this item.


Reagent Drawer (view from top)
CALIBRATION
CALIBRATION

Rotor calibration pin locates through slot marked “Calibration” and into hole underneath

Rotor calibration pin correctly inserted

Correct Insertion of Rotor Calibration Pin

1.1.5 Instrument Disassembly

ATTENTION
Never lift a fully installed (assembled) instrument from one work bench to another. It must first be dismantled and then reinstalled on the new work bench.

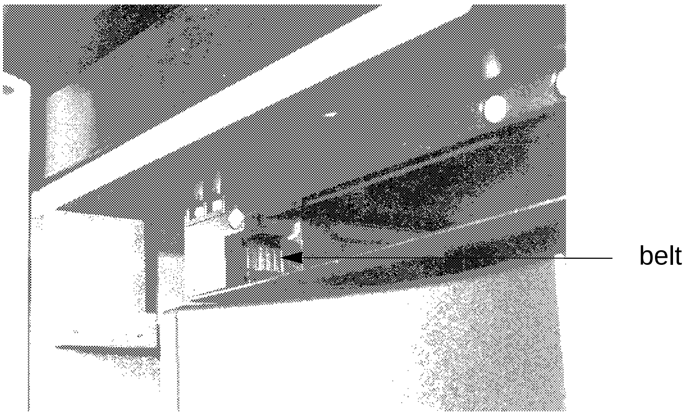
1.1.5.1 Instrument shut down

1.1.5.1.1 Removing the Photometer Filter Case

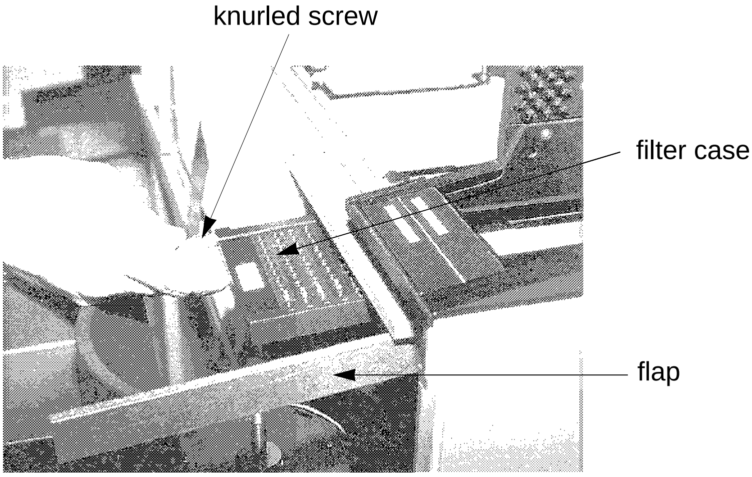
Remove the Filter Case using the macro **FILTERCH.MCR**. Refer to section 1.3.8 on how to run macros.

If performing the macro is not possible, proceed as follows:

Open the end module drawer and the flap to gain access to the filter case housing. Bring the carrier to the front by manually turning the belt.



Loosen the knurled screw, and remove the filter case.



1.1.5.1.2 Removing MTPs and Check Plates

MTPs

All MTPs can be removed from the instrument by selecting “Decontaminate” from the “Maintenance → Incubator” menu.

Check Plate

The Check Plate is positioned in the rear tower extra slot of Incubator 2.

The Check Plate can be removed manually or by selecting “Load check plate” from the “Maintenance → Washer...” menu.

1.1.5.1.3 Decontamination

Refer to chapter 8 of the User Manual for cleaning and decontamination of the instrument.

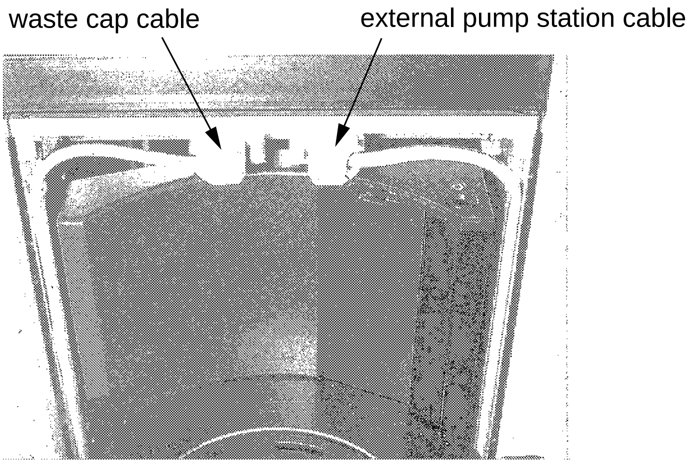
1.1.5.1.4 Draining the washer system

Depending on the instrument configuration run one of the following macros:

- ☐ **W1DRAIN.MCR** for Washer Module 1
- ☐ **W2DRAIN.MCR** for Washer Module 2
- ☐ **W12DRAIN.MCR** for Washer Modules 1 and 2

1.1.5.2 Preparing Modules for Disassembly

Open the Washer/Dispenser drawer(s), remove the reagent carousel(s) and disconnect the waste cap cable and the external pump station cable.



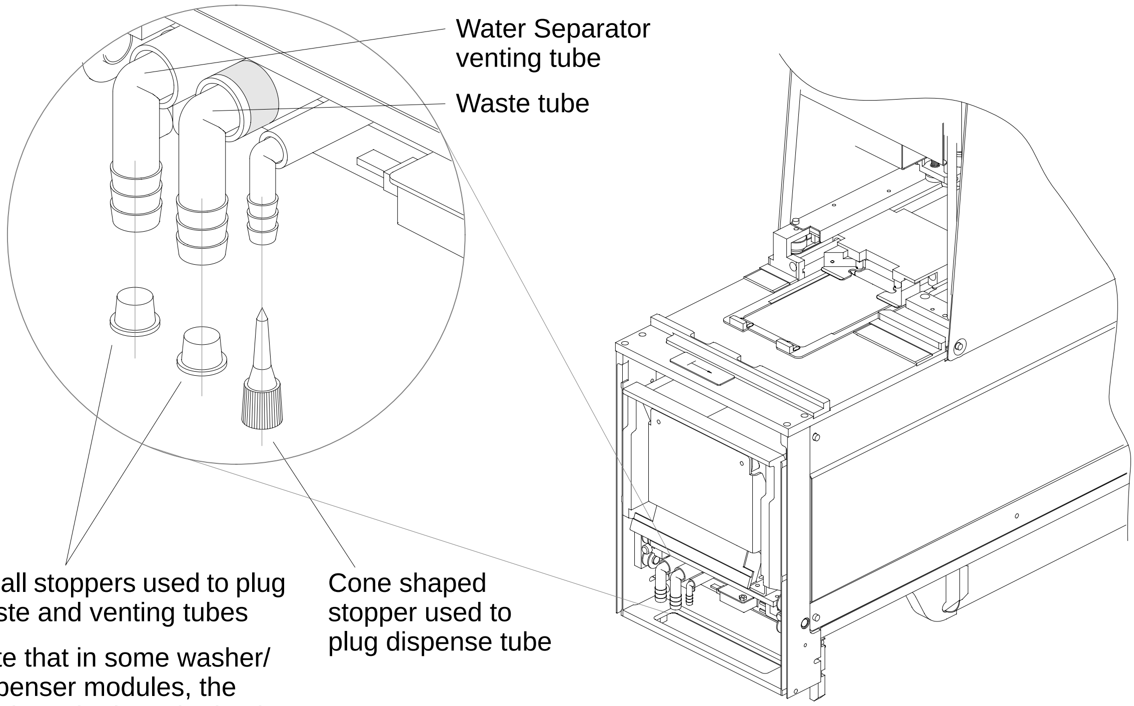
Open the End module drawer and remove the reagent carousel.

BIOHAZARD
HANDLE WITH CARE
BIOGEFÄHRDUNG

Wear Gloves

The waste and vent tubes may be contaminated!

Remove waste, breather and dispense tubing. Plug the three tubes with the stoppers as shown below:


Water Separator venting tube
Waste tube
Small stoppers used to plug waste and venting tubes
Cone shaped stopper used to plug dispense tube

Note that in some washer/ dispenser modules, the venting tube is at the back of the module

Now run the macro corresponding to your instrument configuration:

- ❐ **162SHIP.MCR** for configuration 16/20
- ❐ **163SHIP.MCR** for configuration 16/30
- ❐ **242SHIP.MCR** for configuration 24/20
- ❐ **243SHIP.MCR** for configuration 24/30

With these programs, the entry lift, the incubation towers in Entry and Incubator Modules and the dispenser head in Washer/Dispenser Module are driven to their lowest position.

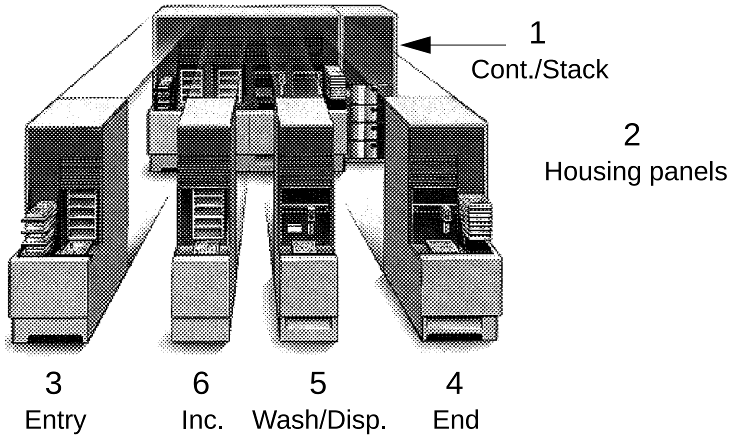
ATTENTION
The drawer cannot be opened anymore once the dispenser head is in its lowest position!

Now switch off and unplug the instrument.

1.1.5.3 Disassembly

⚠ *Switch off and unplug the instrument!*

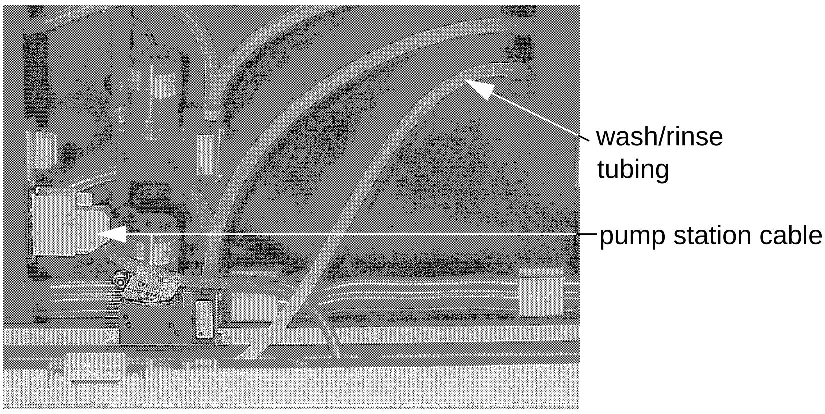
Disassemble the instrument in the following order (when removing all modules):


1
Cont./Stack
2
Housing panels
3
Entry
6
Inc.
5
Wash/Disp.
4
End

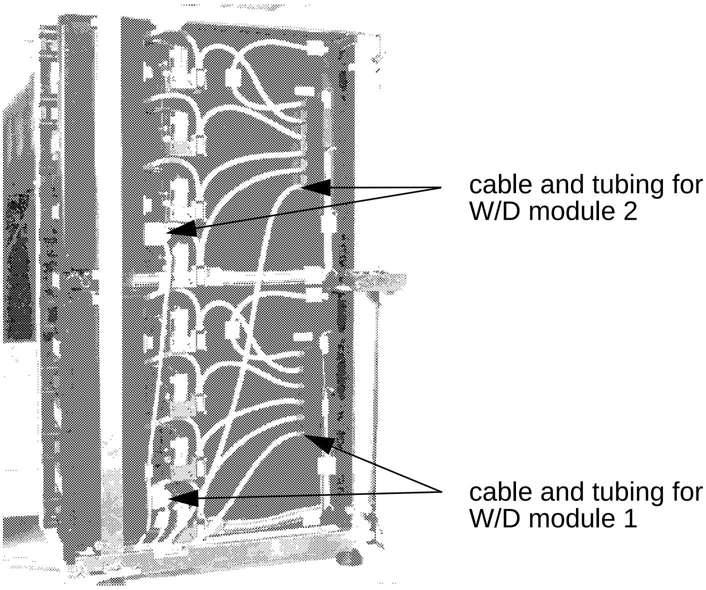
1.1.5.3.1 Removing Container Stack

Open the container stack door and disconnect the wash / rinse solution tube and pump station cable.

Configurations 16/20 & 16/30:

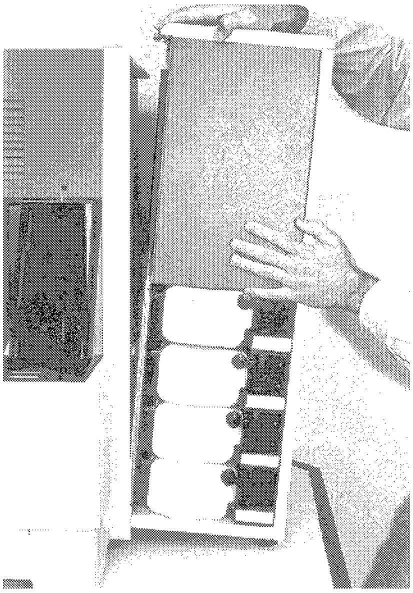

wash/rinse tubing
pump station cable

Configurations 24/20 & 24/30:


cable and tubing for W/D module 2
cable and tubing for W/D module 1

Remove all tools from the inside of the container stack door.

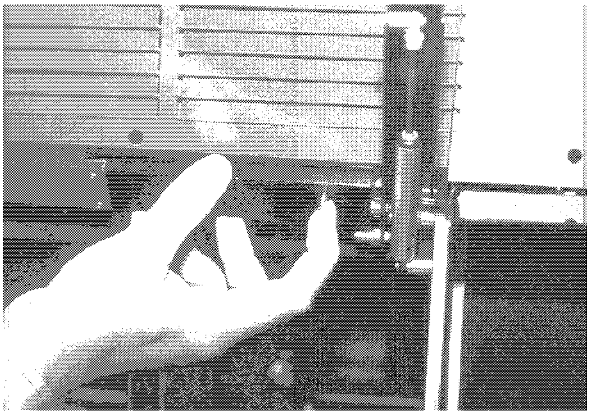
Carefully remove the container stack by tilting it to the right [Weight: 24 kg (53 lbs)], then lift away.



1.1.5.3.2 Removing Panels & Main Shuttle Rail

Transparent Cover

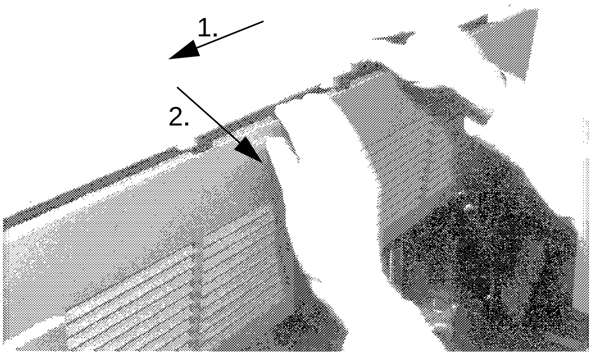
Lift the transparent cover, press in the two visible locking pins, and remove the transparent cover.



Upper Front

Slide the upper front from right to left out of position.

Slightly lift the front edge of the hardtop, align with the notches, and pull the upper front away from the hardtop.



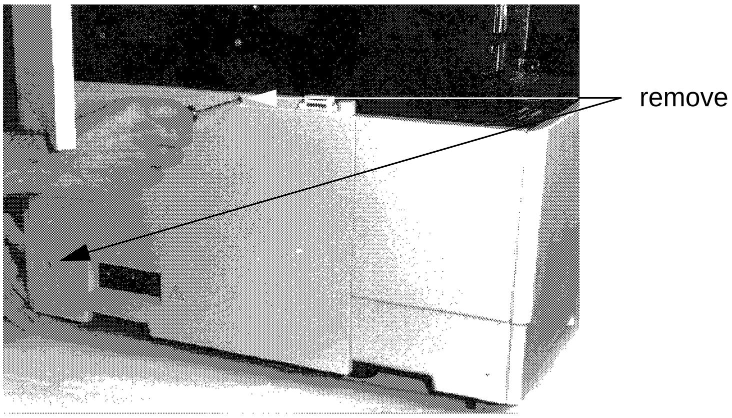
Unscrew the ground cable from Entry hood or Upper Front and lift off the latter.

Hardtop

Unscrew the three screws on top and remove the hardtop.

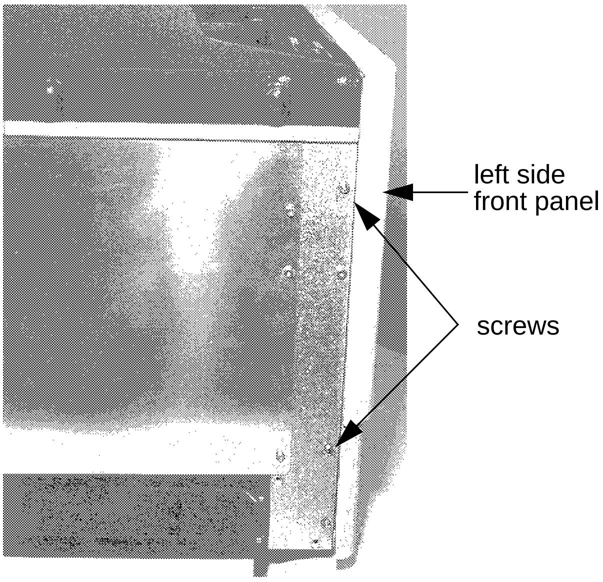
Cover Mains Power

Hold the left side of the panel when removing. Unfasten the two screws and slide the panel to the left.



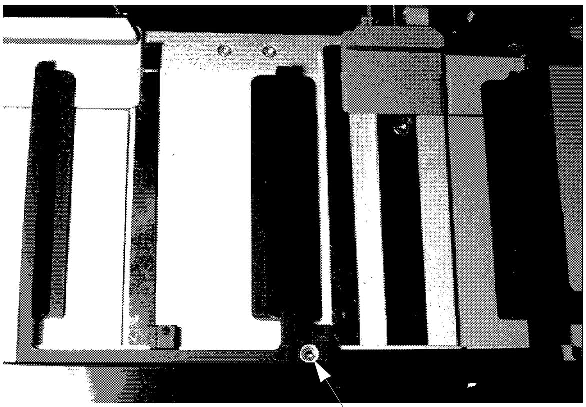
Left Side Front

Unfasten the two screws, slide the panel to the left, and remove.


left side
front panel
screws

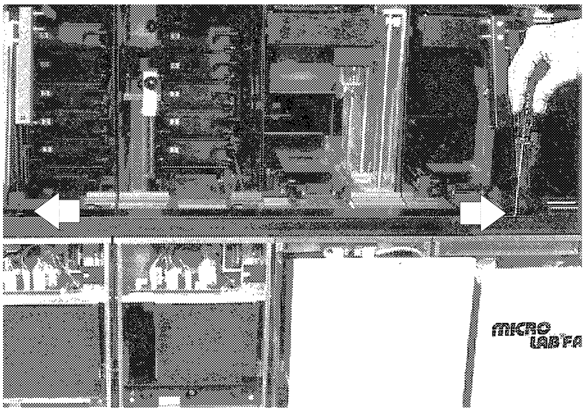
Main Shuttle Rail

The MTP transporter is attached to the main shuttle rail by a screw. Unscrew and lift off MTP transporter.



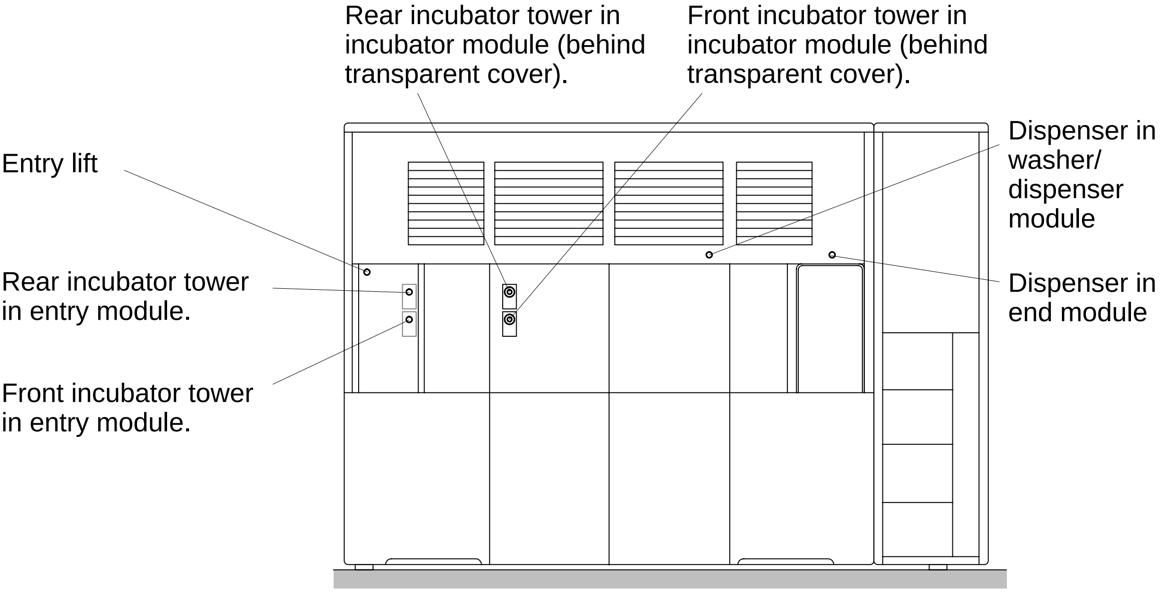
unscrew

Open both reagent drawers, unscrew the two rail screws, and pull the main shuttle rail straight out.

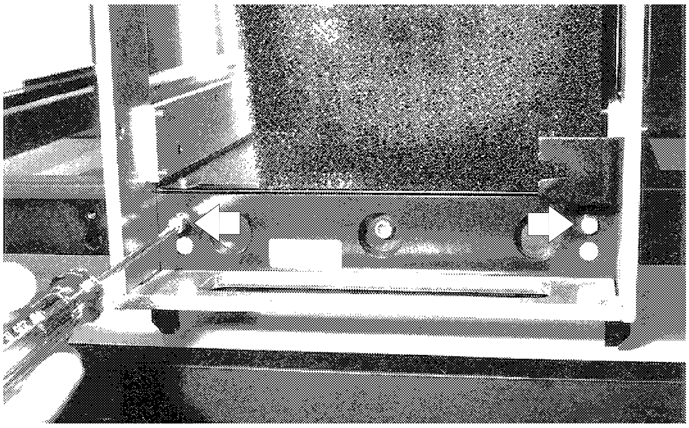


1.1.5.3.3 Handling and Removal of Modules

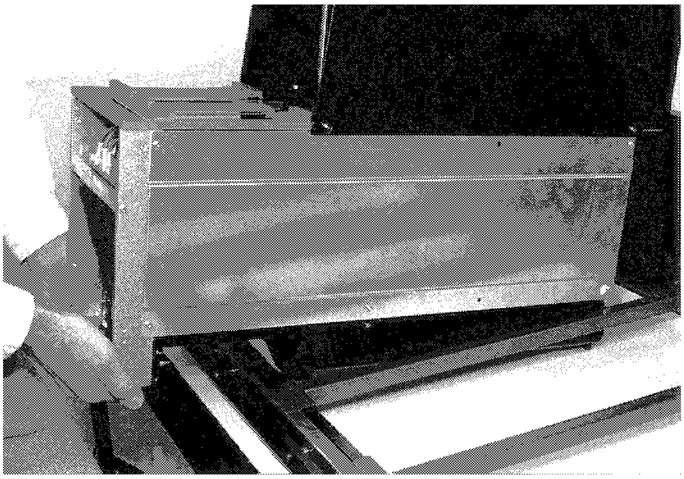
Unless the ship-program (see section 1.1.5.2) has been run successfully, use the height mover tool to crank the incubation towers in both the Entry and Incubator Module as well as the entry lift to the lowest position. For location of height mover tool insertion points see the following picture.


Rear incubator tower in incubator module (behind transparent cover).
Front incubator tower in incubator module (behind transparent cover).
Entry lift
Dispenser in washer/ dispenser module
Rear incubator tower in entry module.
Dispenser in end module
Front incubator tower in entry module.

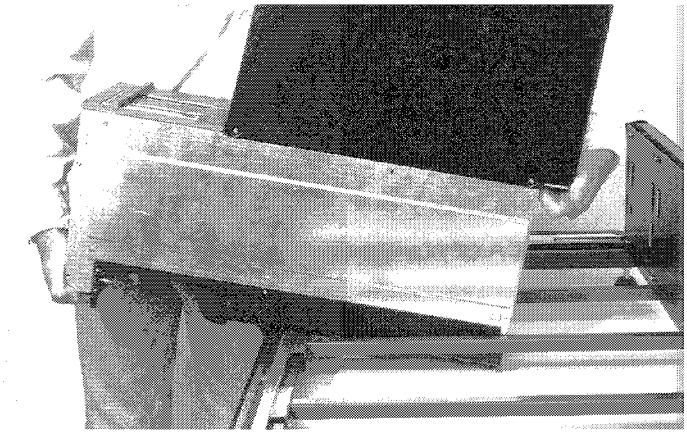
Remove each module’s mounting screws (two).



Pull module straight out until rear connectors are separated.

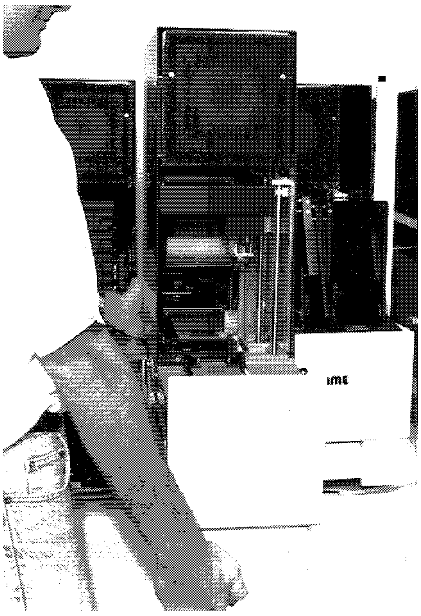


Proper handling of Incubator, Washer/Dispenser, and End Modules.



When only removing the Incubator or Washer/Dispenser, lift the front of the module and pull it half way out.

Level the module and slide it forward until the rear handle can be held.



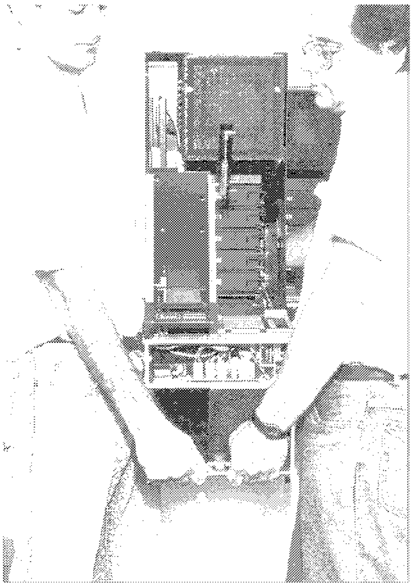
Removing Entry Module

Entry Module weighs: 60 kg (132 lbs.)

Remove User Manual and Entry Stack.

Carefully follow the instructions in section 1.1.5.3.3.

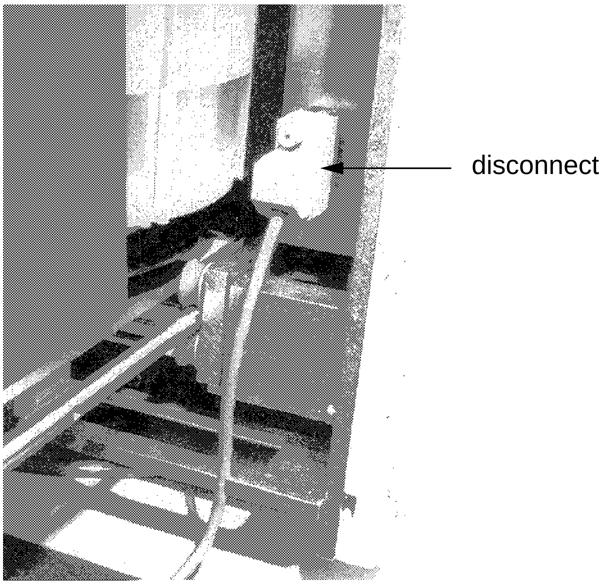
Two persons are needed to lift the Entry Module from the chassis. Hold the front and rear handles to remove the module.



Removing End Module

End Module weighs: 35 kg (77 lbs.)

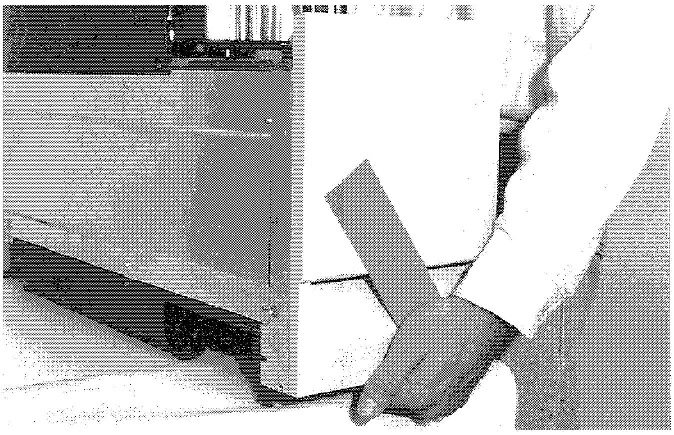
Open the reagent drawer and disconnect the computer cable (RS 232).



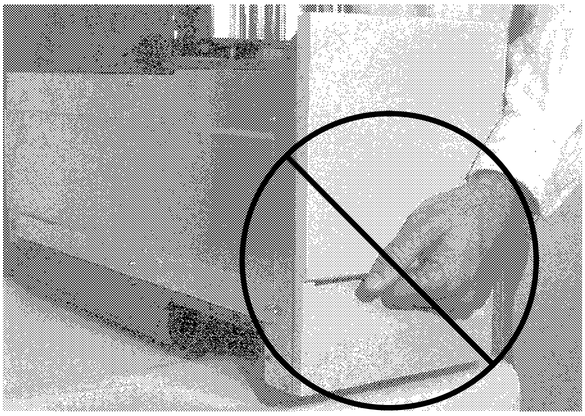
Using the height mover tool crank the dispenser head to the lowest position.

ATTENTION
The drawer cannot be opened anymore once the dispenser head is in its lowest position!

ATTENTION
Never use the drawer handle to lift the End Module or the Washer/ Dispenser Module! Grasp the frame underneath the drawer panel.



correct



incorrect

Removing Washer / Dispenser Module

W/D Module weighs 35 kg (77 lbs.)

Unless the ship-program (see section 1.1.5.2) has been run successfully, use the height mover tool to crank the dispenser head to the lowest position.

ATTENTION
The drawer cannot be opened anymore once the dispenser head is in its lowest position!

Removing Incubator Module

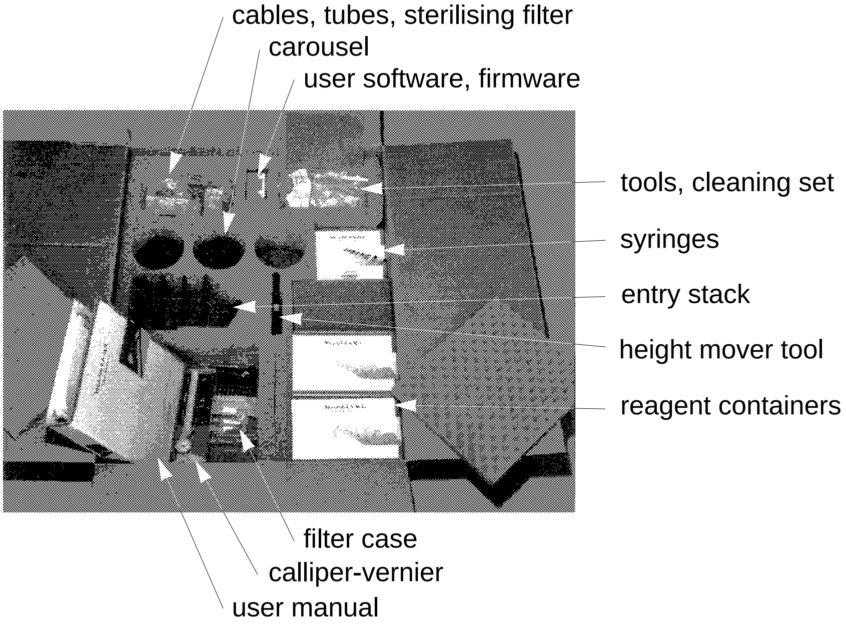
Incubator weighs: 32 kg (71 lbs.)

Remove incubator module mounting screws and lift module away.

1.1.6 Packing F.A.M.E. for Shipment

1.1.6.1 Packing the accessory box

Remove carousels from drawers. Remove syringes from reagent containers and pack them in their respective boxes. Also pack user manual, waste container cap and tools in the accessory box.

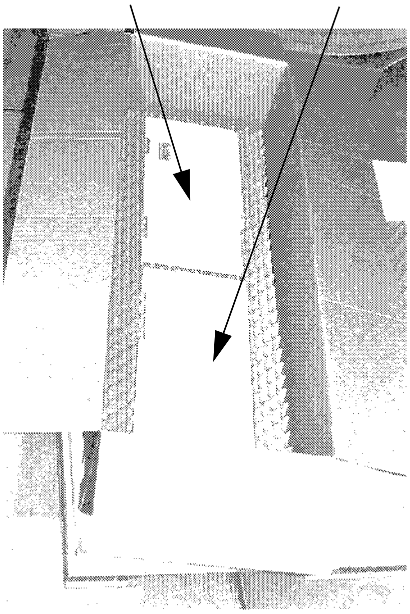

cables, tubes, sterilising filter
carousel
user software, firmware
tools, cleaning set
syringes
entry stack
height mover tool
reagent containers
filter case
calliper-vernier
user manual

1.1.6.2 Packing housing parts box

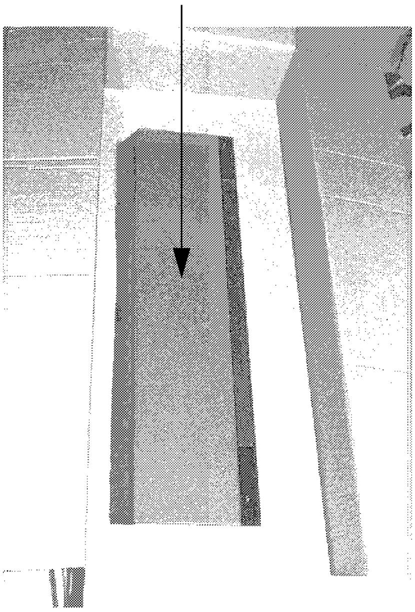
Place foam layer in the empty box, and pack in the following order:

- ❒ cover mains power, left side front, cardboard layer
- ❒ transparent cover, foam layer
- ❒ main shuttle rail, upper front, foam layer
- ❒ hardtop

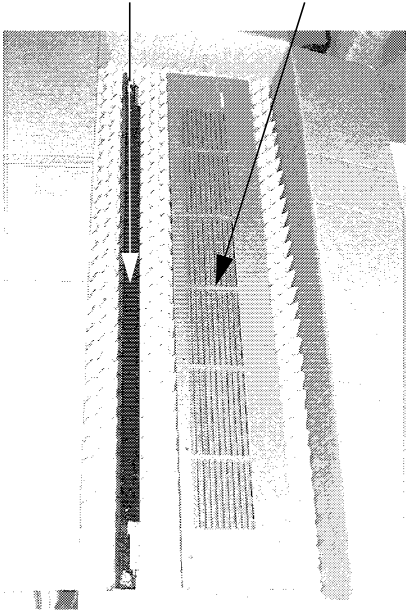
1. cover mains power & left side front



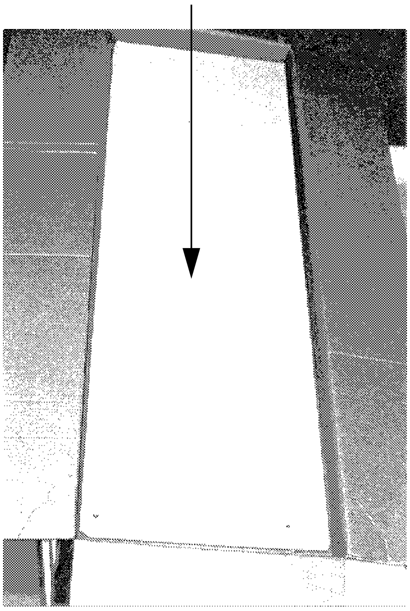
2. transparent cover



3. main shuttle rail & upper front

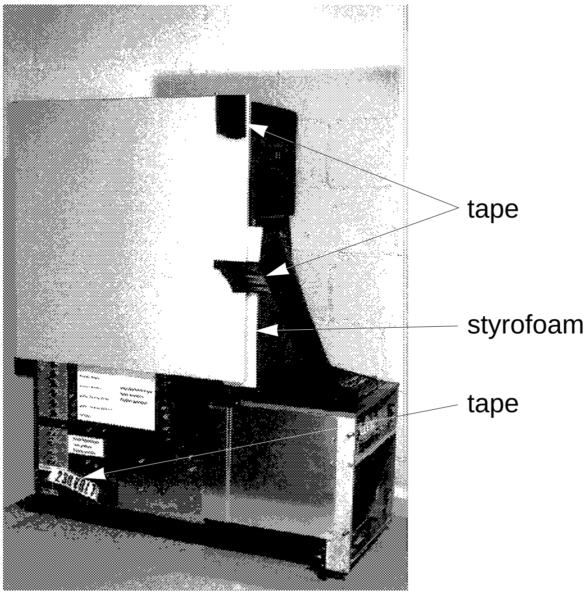


4. hardtop

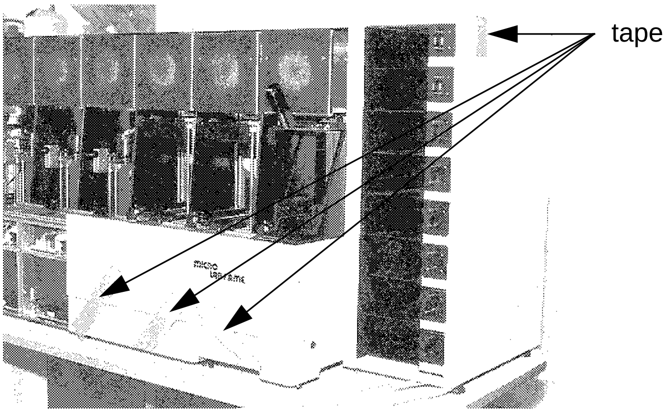


1.1.6.3 Preparing modules for shipment

Place sheet of styrofoam between door and frame, tape power switch and user manual door.



Tape reagent drawer handles and container stack door (do not lift module by drawer handle!).

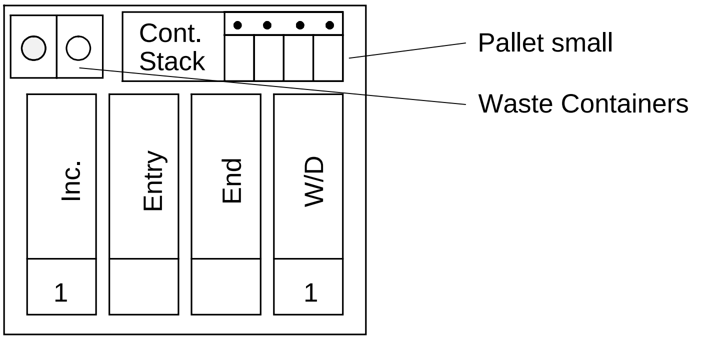


1.1.6.4 Placing modules onto shipping pallet

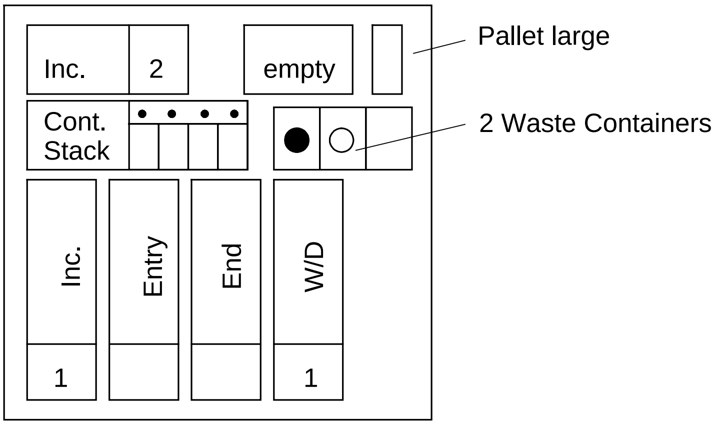
Place entry module onto pallet first (2 persons required).

Placement of modules on pallet. (all configurations):

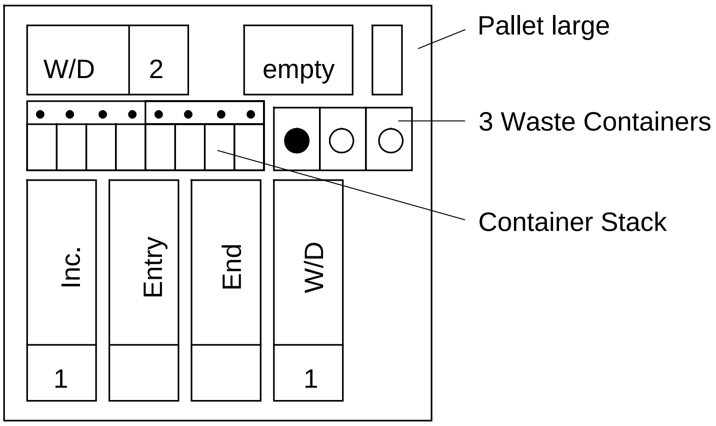
16/20


Cont.
Stack
Pallet small
Waste Containers
Inc.
Entry
End
W/D
1
1

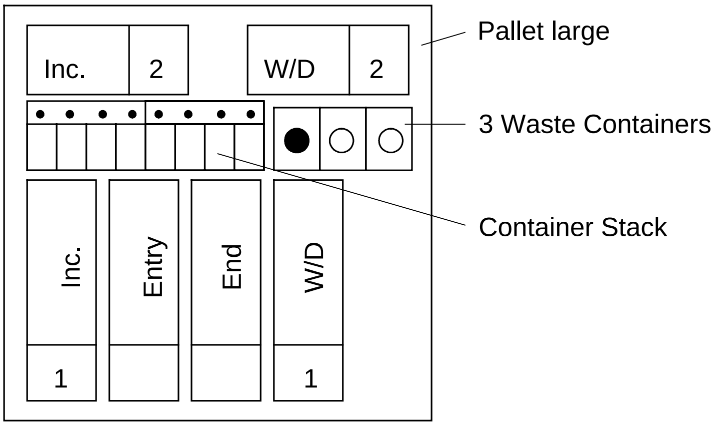
16/30


Inc.
2
empty
Pallet large
Cont.
Stack
2 Waste Containers
Inc.
Entry
End
W/D
1
1

24/20

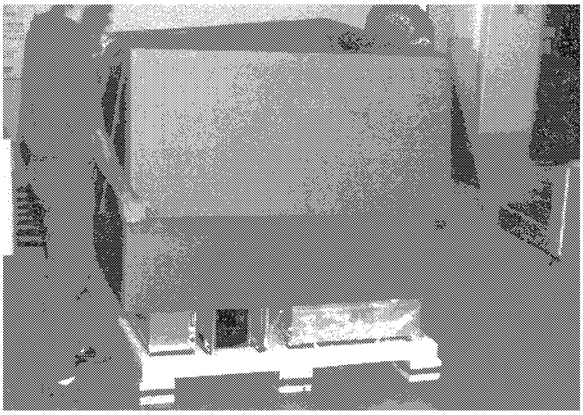

W/D
2
empty
Pallet large
3 Waste Containers
Container Stack
Inc.
Entry
End
W/D
1
1

24/30

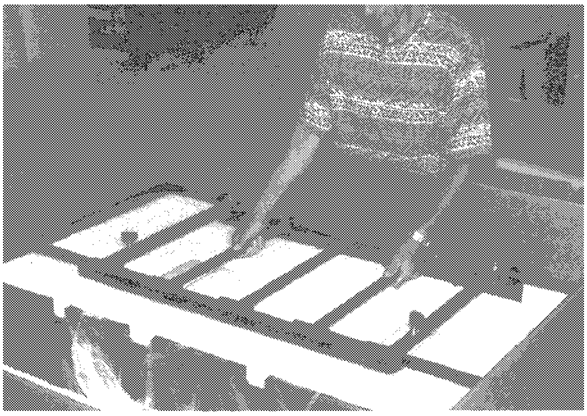

Inc.
2
W/D
2
Pallet large
3 Waste Containers
Container Stack
Inc.
Entry
End
W/D
1
1

Wrap modules with plastic covers and place foam insert over container stack and waste containers.

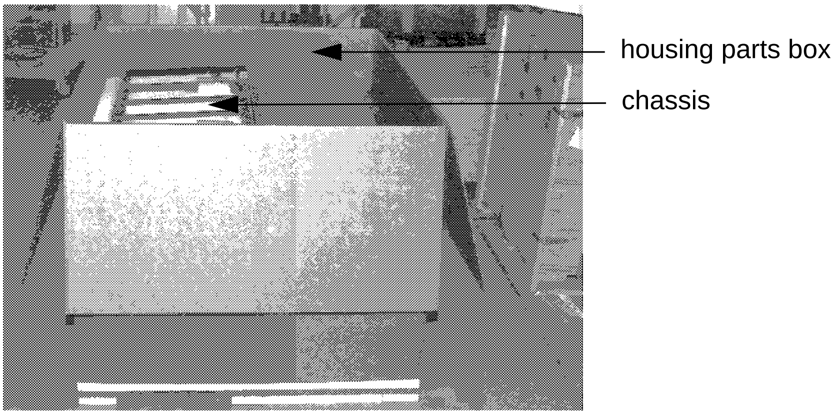
Lower cardboard on to pallet.



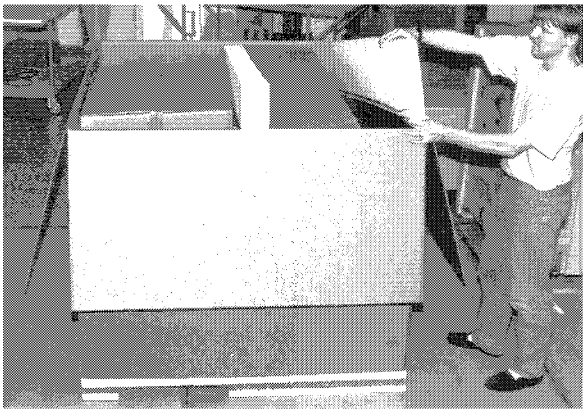
Position foam on top of modules and insert chassis.



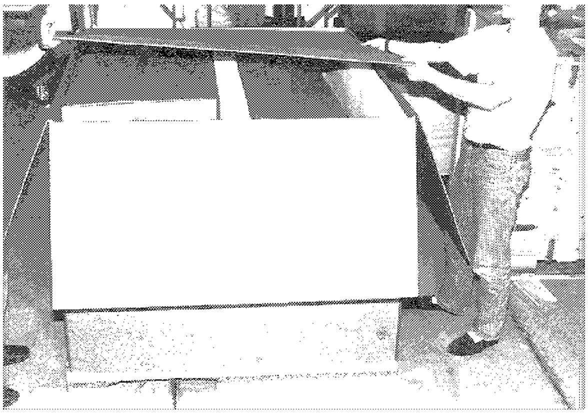
Pack housing parts box.


housing parts box
chassis

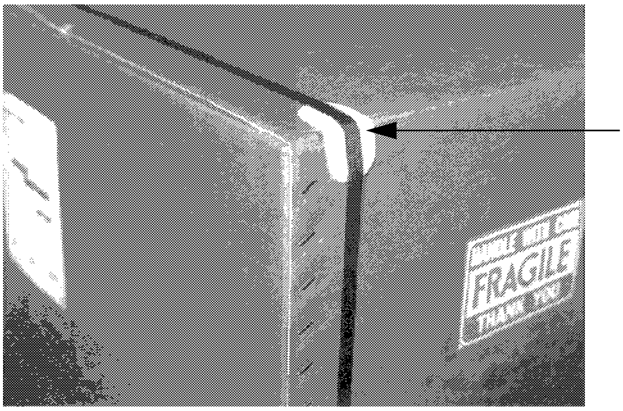
Place accessory box on top of the chassis and pack the two foam inserts.



Lay cardboard sheet on top.

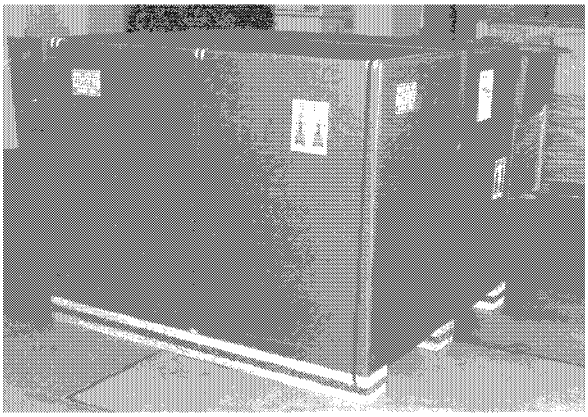


Use strap supports on cardboard edges.


HANDLE WITH CARE
FRAGILE
THANK YOU

strap support

Completely packed Microlab F.A.M.E.



1.1.7 Exchange Modules

Exchanging modules minimizes instrument down-time and allows thorough troubleshooting and repair at dealers workshop or Hamilton.

For description and parts lists of Exchange Modules see “Exchange Modules and Exchange Module Parts Lists” on page 52.

Note

❐ Before removing a module from the chassis, refer to the respective sections **2.1.5 Removing Entry Module, 3.1.5 Removing Incubator Module, 4.1.3 Removing Washer / Dispenser Module and 5.1.4 Removing End Module**.

ATTENTION
Make sure the Module to be sent for repair has been decontaminated.

1.1.7.1 Removing modules from chassis

For removing the modules and container stack refer to section 1.1.5.

1.1.7.2 Repacking the defective Module

Carefully pack the defective Module so it will not be damaged during transport.

1.1.8 Expansion Modules

1.1.8.1 General

For description of Expansion Modules see “Expansion Modules and Expansion Module Parts Lists” on page 55.

Note

- ❐ Before removing a module from the chassis, refer to the respective sections **2.1.5 Removing Entry Module, 3.1.5 Removing Incubator Module, 4.1.3 Removing Washer / Dispenser Module and 5.1.4 Removing End Module**.
- ❐ When an instrument is upgraded to an extended version, the corresponding main shuttle rail and housing panels are delivered with the expansion modules.

1.1.8.2 Removing modules from chassis

For removing the modules and container stack refer to section 1.1.5. All modules and the container stack must be removed from the chassis.

1.1.8.3 Installing the Expansion Module

First the chassis must be adjusted to the new instrument configuration. Refer to page 72.

Install all modules and container stack. See section 1.1.4 Microlab F.A.M.E. Installation.

In order to install the housing panels, first remove the mounting brackets from the old panels and mount them on the new ones.

Adjusting of drawer front:

- ❐ adjusting of space between panels
- ❐ adjusting of height
- ❐ adjusting of angle to front

in order to do this you have to:

- ❐ remove drawer compartment
- ❐ adjust drawer front mounting brackets (there are slots)
- ❐ be careful that the reagent carrousel support does not touch the drawer compartment when remounting the latter

1.1.9 Decontamination

ATTENTION
Consult the detailed decontamination procedures in the maintenance chapter of the ML F.A.M.E. User Manual.

1.1.10 Maintenance

1.1.10.1 General maintenance

Hamilton recommends that a yearly preventive service is carried out:

- Clean the instrument. Always be aware that samples may be infectious.
  Pay attention to the laboratory work procedures.
- Change all tubing
- Change all ventilator filters
- Clean all optical sensors
- Check all drives:
  - check belt tension
  - check belt for wear
  - check for smooth operation
- Dispenser arm x-drive bearings: see section 1.1.10.3.1 Dispenser arm x-drive bearings
- Z-spindle: see section 1.1.10.3.2 Lubrication of z-spindle
- Plunger drive spindle: see section 1.1.10.3.3 Lubrication of plunger drive spindle

For more frequent User Maintenance refer to User Manual Chapter 8.

1.1.10.2 Half Yearly Maintenance / Service

1.1.10.2.1 Tasks

Half yearly maintenance is normally carried out by the service technician when the instrument is serviced.

The table below shows each task that should be carried out and whether a macro program is available to execute or assist with the task.

Half Yearly Maintenance	Macro program available?
Blow out air filters	
Decontaminate washers	As in UM section 8.4.4
Decontaminate all incubators	As in UM section 8.4.5

Drain washer system	`W1DRAIN.MCR`
	`W2DRAIN.MCR`
	`W12DRAIN.MCR`

Clean wash shell	
Renew tubings	
Load new check plate into extra position of incubator 2	`LOADWCHK.MCR` (can also be loaded from a menu choice)
Weekly maintenance	As in UM section 8.3
General instrument calibration	
Verify instrument with verification kit	

1.1.10.2.2 Running Macros for Half Yearly Maintenance/Service

Refer to section 1.3.8 on how to run macros.

1.1.10.2.3 Macros Available for Maintenance/Service

All maintenance macros are located in the directory `\FAME\MACRO`.

The following macros are available to assist with maintenance:

Macro file name	Function of macro
`LOADWCHK.MCR`	Puts NUNC plate in extra position of incubator 2.
`W1RINSE.MCR`	Rinses washer W1.
`W2RINSE.MCR`	Rinses washer W2 (24/20 and 24/30 configurations only).
`W12RINSE.MCR`	Both Washers
`W1DRAIN.MCR`	Drains washer W1
`W2DRAIN.MCR`	Drains washer W2 (24/20 and 24/30 configurations only)
`W12DRAIN.MCR`	Both Washers
`FILTERCH.MCR`	Moves photometer filter case to its front position to allow removal.

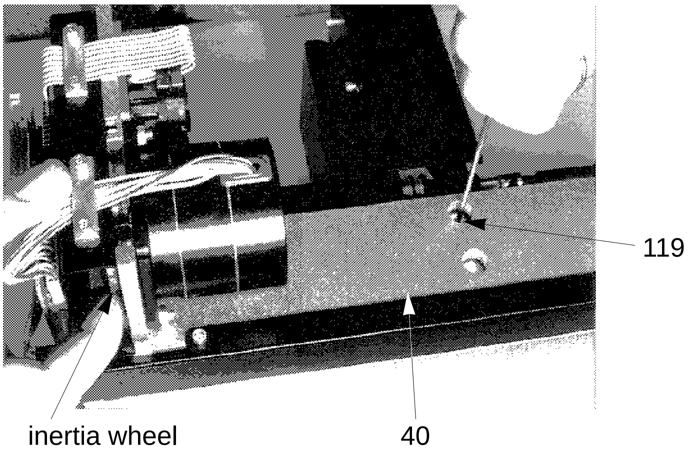
1.1.10.3 Preventive maintenance

1.1.10.3.1 Dispenser arm x-drive bearings

Hamilton recommends to grease the dispenser arm x-drive bearings *once or twice a year*.

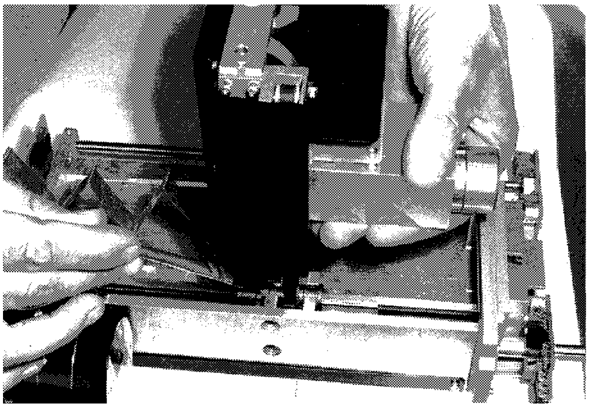
Remove the dispenser from the W/D module (see section 4.1.4.1).

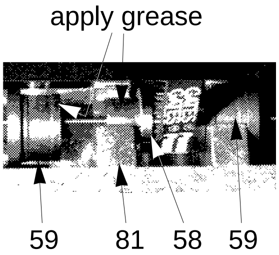
Align one of the *setscrews item 119* with the hole in *the side plate item 40* by turning inertia wheel or by using height mover tool.



In earlier instruments, setscrew *item 119* is made of plastic. Use a screwdriver size 0 and unscrew carefully. When reinstalling bushing, replace plastic setscrew with a steel setscrew.

Separate *bushing item 59* from *pulley 3 item 58*, pull pulley 3 out of the other *bushing item 59* and apply some Molykote DX grease to *both* bearing surfaces (move dispensing head in order to turn pulley 3).

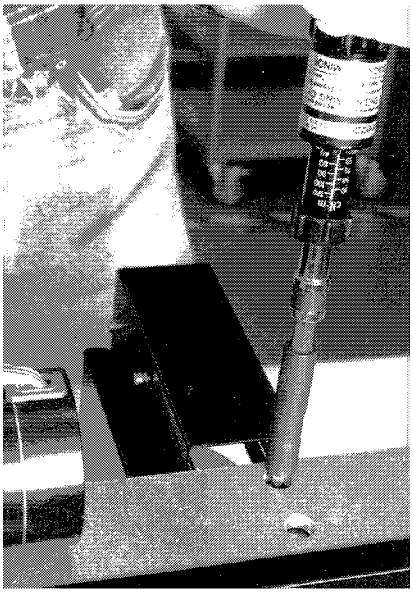




Press bushing item 59 firmly onto Z-guide item 81, apply Loctite 222 to setscrew item 119 and tighten to a torque of 40 Ncm (3.5 in/lbs).

Repeat the above with the other bushing.

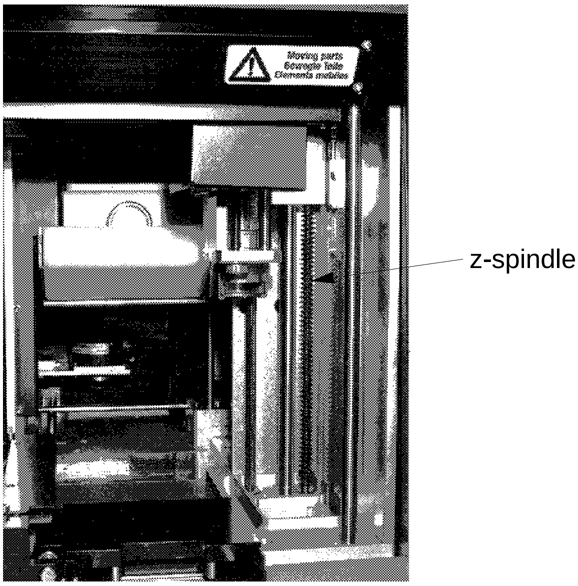
ATTENTION
0vertightening will cause bearings to seize.



1.1.10.3.2 Lubrication of z-spindle

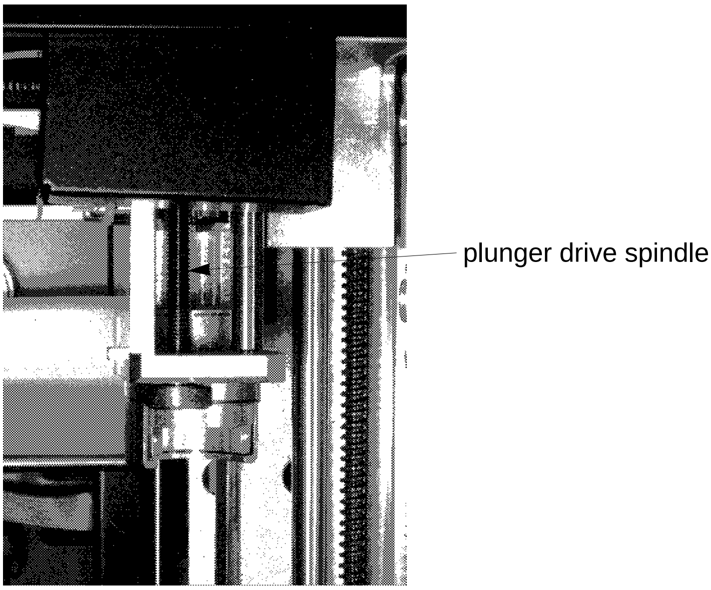
Clean the *z-spindle item 65* (Washer/Dispenser module, End module) with a lint-free cloth. Lubricate with oil or grease, depending on spindle installed:

- ❒ Uncoated shaft (ordinary steel color): use Microgliss D-5 oil.
- ❒ Coated shaft (dark gray): use Molykote DX grease.


Moving parts
Bewegte Teile
Eléments mobiles
z-spindle

1.1.10.3.3 Lubrication of plunger drive spindle

Clean the *plunger drive spindle item 31* (Washer/Dispenser module, End module) with a lint-free cloth and lubricate with Microgliss D-5 oil.


plunger drive spindle

1.2 Microlab AT / AT plus / AT plus 2

1.2.1 Operating Microlab AT with Microlab F.A.M.E

By linking the Microlab AT plus and Microlab F.A.M.E., Hamilton offers a complete line of instruments for fast and reliable sample preparation and processing with complete documentation. The only manual step remaining is the transport of pipetted plates from the AT plus to the Microlab F.A.M.E. Laboratory work was never so simple.

1.2.2 Microlab AT User Manuals

❐ **ML AT Software Manuals:**

❑ English	610 359
❑ German	610 358
❑ English (with software)	610 356
❑ German (with software)	610 354

❐ **ML AT Hardware Manuals**

❑ English	610 352
❑ German	610 350

1.2.3 Microlab AT plus 2 User Manuals

- ❐ User Manual (English): p/n 610 362
- ❐ User Manual (German): p/n 610 360
- ❐ User Manual without disks (English): p/n 610 369
- ❐ User Manual without disks (German): p/n 610 368

1.2.4 Microlab AT / AT plus Service Manuals

❐ Microlab AT	p/n 610 198
❐ Microlab AT plus	p/n 610 271

1.3 F.A.M.E. Software

1.3.1 Personal Computer Requirements

The minimum requirements for the PC are given below.

Microprocessor type:	486DX
Hard disk:	200 MB
RAM:	16 MB
Floppy disk drive:	1 drive (3½”)
Interface cards:	1 serial port (RS232C) for connection to Microlab F.A.M.E. 1 parallel port for the printer
VGA monitor:	Colour monitor supported by OS/2
Keyboard:	IBM (or 100% compatible)
Mouse:	Any mouse supported by OS/2

1.3.2 ML F.A.M.E. System Requirements

☐ ML F.A.M.E. Software

☐ ML F.A.M.E. Instrument

☐ Printer

☐ PC complete (monitor, mouse, keyboard)

☐ LAN (optional)

1.3.3 Software Requirements

Operating System:	OS/2 V2.1 or higher (English version)
Database:	IBM DB 2 for OS/2 V1.0 or higher

1.3.4 Microlab F.A.M.E. Software Specifications

Number of methods storable in database:	100 max.
Number of kit lots per method:	100 max.
Number of test results storable in database:	100 max.
Maximum size of a test result report:	8 - 10 Kilobytes (depends on format)
Number of QC-Charts storable in database:	1000 max.
Number of values in a QC-Chart:	10000 max.
Number of reagents definable:	100 max.
Number of Entry Stack configuration types:	max. 10 per run total 100
Number of worklists storable in database:	100 max.
Number of users:	100 max.
Number of instruments controllable by one PC:	2 max.
Printers supported:	All graphic mode printers supported by OS/2

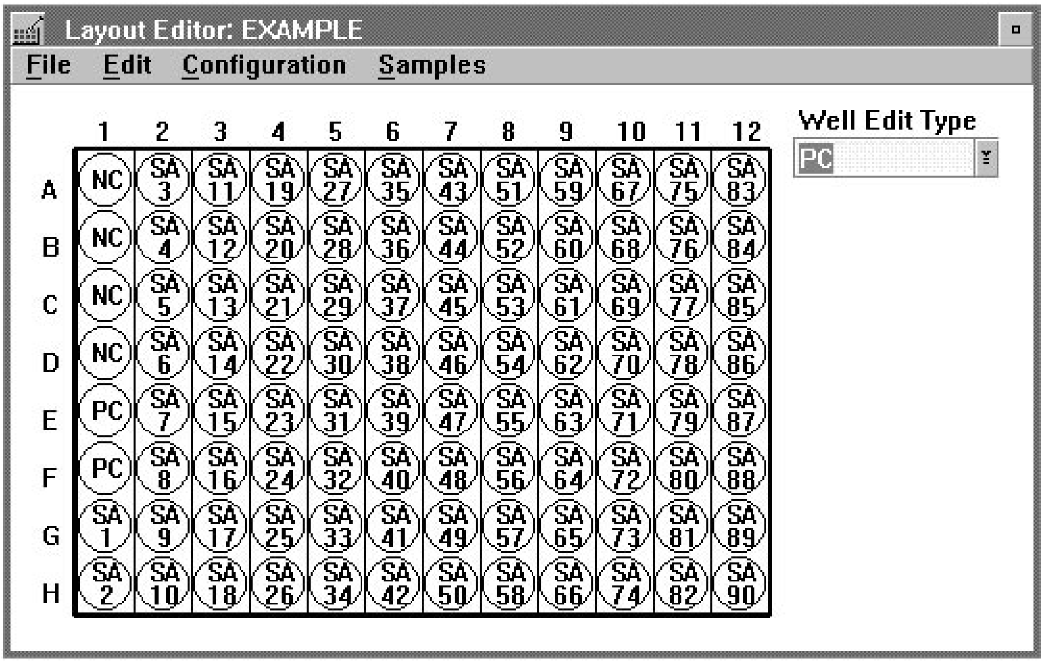
1.3.5 Connections to Sample Preparation Instruments

ATTENTION
Consult appendix A (Advanced Features) of the Microlab F.A.M.E. User Manual. Topics covered: How to communicate between sampling instruments and Microlab F.A.M.E., Connection to Host and Other Applications,

1.3.6 Overview

- ❐ Access / Login
- ❐ Configuration
- ❐ User SW (Service Level)
- ❐ Diagnostics

Any automated system needs a powerful computer with well-suited software with multitasking and LAN capabilities as basic requirements. Since an open system is required, the software must be both flexible enough to edit ELISA methods of different manufacturers and easy to be understood and used. By choosing a graphical user interface and the implementation of an extensive context-sensitive help program these necessities are fulfilled. The greatest challenge for software to handle the daily routine work is the optimal use of the instrument, i.e. the fastest possible processing of the tests with minimal user attendance (or maximized walk-away time). A workload optimising program with user advice and continuous monitoring of the system conditions is included in the software solution.



Well Edit Type: PC

	1	2	3	4	5	6	7	8	9	10	11	12
A	NC	SA 3	SA 11	SA 19	SA 27	SA 35	SA 43	SA 51	SA 59	SA 67	SA 75	SA 83
B	NC	SA 4	SA 12	SA 20	SA 28	SA 36	SA 44	SA 52	SA 60	SA 68	SA 76	SA 84
C	NC	SA 5	SA 13	SA 21	SA 29	SA 37	SA 45	SA 53	SA 61	SA 69	SA 77	SA 85
D	NC	SA 6	SA 14	SA 22	SA 30	SA 38	SA 46	SA 54	SA 62	SA 70	SA 78	SA 86
E	PC	SA 7	SA 15	SA 23	SA 31	SA 39	SA 47	SA 55	SA 63	SA 71	SA 79	SA 87
F	PC	SA 8	SA 16	SA 24	SA 32	SA 40	SA 48	SA 56	SA 64	SA 72	SA 80	SA 88
G	SA 1	SA 9	SA 17	SA 25	SA 33	SA 41	SA 49	SA 57	SA 65	SA 73	SA 81	SA 89
H	SA 2	SA 10	SA 18	SA 26	SA 34	SA 42	SA 50	SA 58	SA 66	SA 74	SA 82	SA 90

Typical screen of the ML F.A.M.E. Software

For software development, OS/2 and its user interface (Presentation Manager) was selected, since it has multitasking and LAN capabilities and contains functions, able to handle large database.

The main software tasks can be divided into several functions:

- ❐ SOFTWARE FOR DAILY ROUTINE
  an essential part of this function is an actions list for daily routine work, including an optimal loading schedule sufficiently flexible to react whenever deviations of the calculated times occur (i.e. unexpected additional microplates, later or earlier plate loading).

Necessary user attendances are given in the action list (e.g. when to load unstable reagents, etc.).

- ❐ SOFTWARE FOR METHOD DEFINITION:
  this function includes the definition of all data relevant for plate processing, i.e. method information, plate layout, definition of processing steps and test-specific data evaluation and validation procedures, including documentation. The program design allows the processing of the vast majority of available test kits according to the manufacturer’s instructions.

Additional functions include software for quality control charts and system maintenance. One of the most important functions of the software is the context-sensitive help program to inform the user at any time about specific software functions. To prevent unauthorized or unintentional alterations of programs, different access levels for different user groups can be defined.

1.3.7 Diagnostic Master

Microlab F.A.M.E. is equipped with a newly designed diagnostics system, called DIAGNOSTIC MASTER (DM). Experts’ know-how and experience in troubleshooting are presented in a simple, user-friendly way in the F.A.M.E. computer system.

DM guides the user through an easy-to-use user environment. A diagnosis is represented efficiently due to modern design techniques. During error handling, data for storage is produced before, during and after diagnosis. For this purpose there is a database interface containing diverse information about the performed diagnoses. This allows statistical evaluation of failures.

The structure and function of Diagnostic Master are explained in a special Manual or in the Online Help.

To access DM, open the Service and Diagnostics window (select **Service and diagnostics...** from the **Service** menu in the main F.A.M.E. window).

In the Service and Diagnostics window, select **Diagnostic-Master...** from the **Diagnostics** menu.

1.3.8 How to run macros

ATTENTION
When running any macros, carry out carefully and only the instructions which appear on the computer screen.

Select **Service and diagnostics...** from the **Services** menu in the main F.A.M.E. window. The Service and diagnostics window will then appear.

The basic procedure for running a macro is as follows:

From within the Service and diagnostics window, select **Start macro...** from the **Run** menu. The Start Macro dialog box will appear listing the macro currently selected (if any).

If a macro is listed, select a different one by clicking on **Change macro...** . If no macro is listed, type **`c:\fame\macro`** in the **Macro file** entry field and click on **Change macro...** .The dialog that then appears lists all available macros. Each macro is a file with a `.MCR` extension.

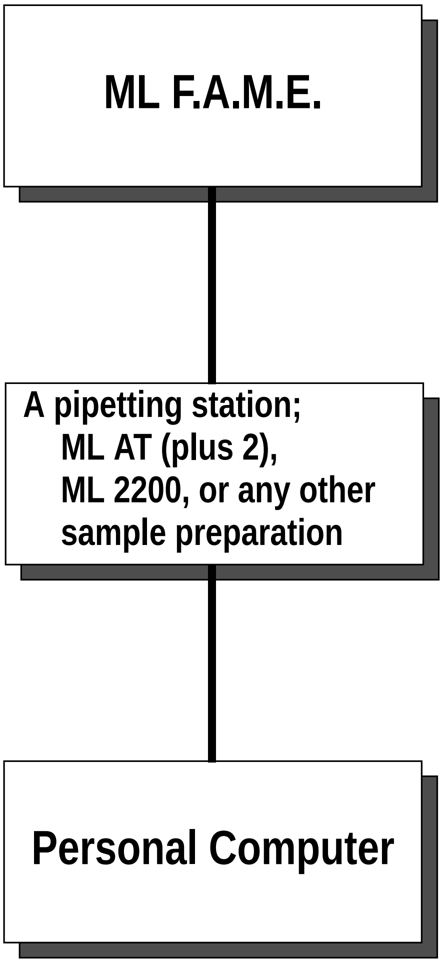
Highlight (click on) the desired macro file in the list marked “File” and then click **OK**.

To run the selected macro, click on **Start** in the Start Macro dialog box.

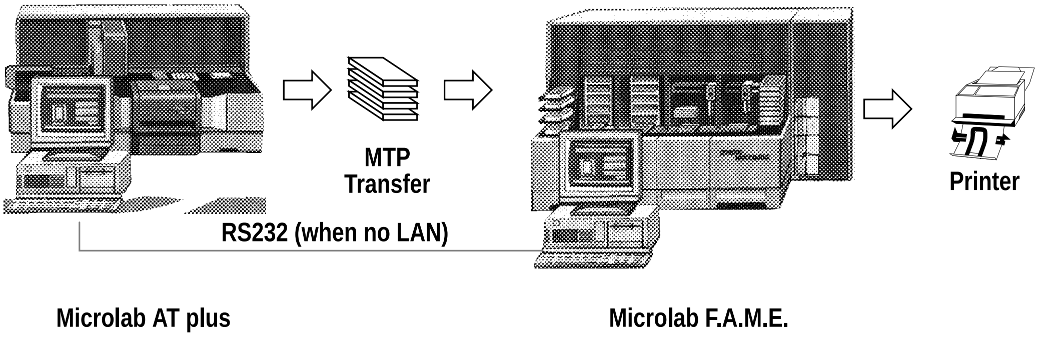
1.4 Totally Integrated Microlab F.A.M.E System

1.4.1 System Specifications

The following system specifications are required for all Microlab F.A.M.E. configurations:


ML F.A.M.E.
A pipetting station;
ML AT (plus 2),
ML 2200, or any other
sample preparation
Personal Computer

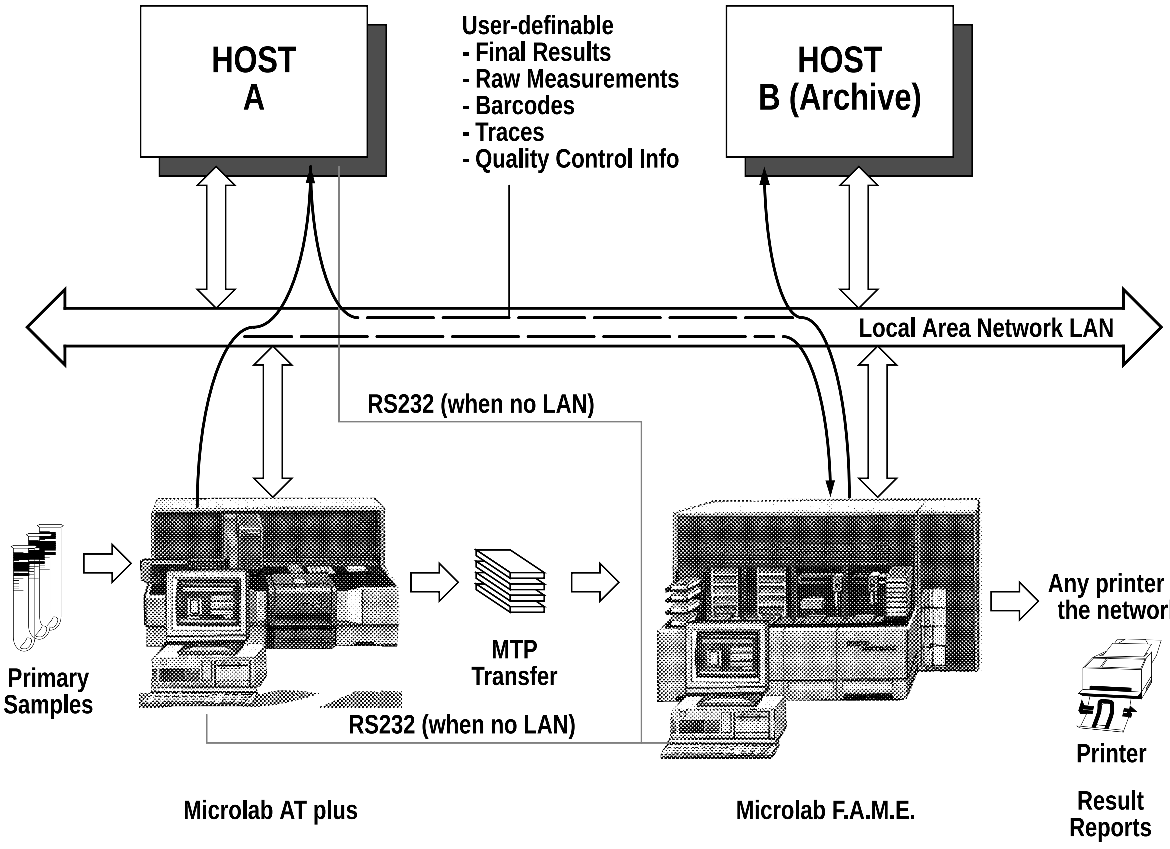
If the ML F.A.M.E. communicates with a pipetting station, pipetting and barcode information are linked to the test results. Result protocols can be printed out or sent to an external communication system.


MTP
Transfer
Printer
RS232 (when no LAN)
Microlab AT plus
Microlab F.A.M.E.

A pipetting station communicates with the ML F.A.M.E.

1.4.2 Integration into Laboratory Information Systems

To enable the integration of the analyzer into existing laboratory data networks, an interface protocol according to the ASTM E-1394 standard was developed for transmitting data. Connecting data derived from sample pipetting robots with microplate results is possible either by direct communication of the two computer systems or via local area networks. The next figure shows different communication pathways and implementation of the analyzer into laboratory networks.


HOST
A
User-definable
- Final Results
- Raw Measurements
- Barcodes
- Traces
- Quality Control Info
HOST
B (Archive)
Local Area Network LAN
RS232 (when no LAN)
Primary Samples
MTP Transfer
Any printer in the network
RS232 (when no LAN)
Printer
Microlab AT plus
Microlab F.A.M.E.
Result Reports

Communication Pathways for the Automated Microplate Analyser

1.4.3 Elisa introduction

ELISA: Enzyme Linked Immuno Sorbent Assay

ELISA is a simple method to measure antigen specific and total immunoglobulins (= Ig). ELISA is an immunosorbent assay in which the bound and free fraction of Ig (ligand) are physically separated by a washing procedure and the antigen to be detected or determined either directly or indirectly physically attached to a solid phase.

Preparation of a test plate:

❒ Step 1:

Antigen in saline is incubated on a plastic plate (or tube). Small quantities become absorbed onto the plastic surface.

❒ Step 2:

Free antigen is washed out. The plate may then be blocked with excess of an irrelevant protein to prevent any subsequent non-specific binding of proteins.

❒ Step 3:

Test antibody is added, which binds to the antigen.

❒ Step 4:

Unbounded proteins are washed out.

❒ Step 5:

Ligand is added (a ligand is a molecule which can detect the antibody and is covenant coupled to an enzyme) and binds the test antibody.

❒ Step 6:

Unbounded ligand is washed out.

❒ Step 7:

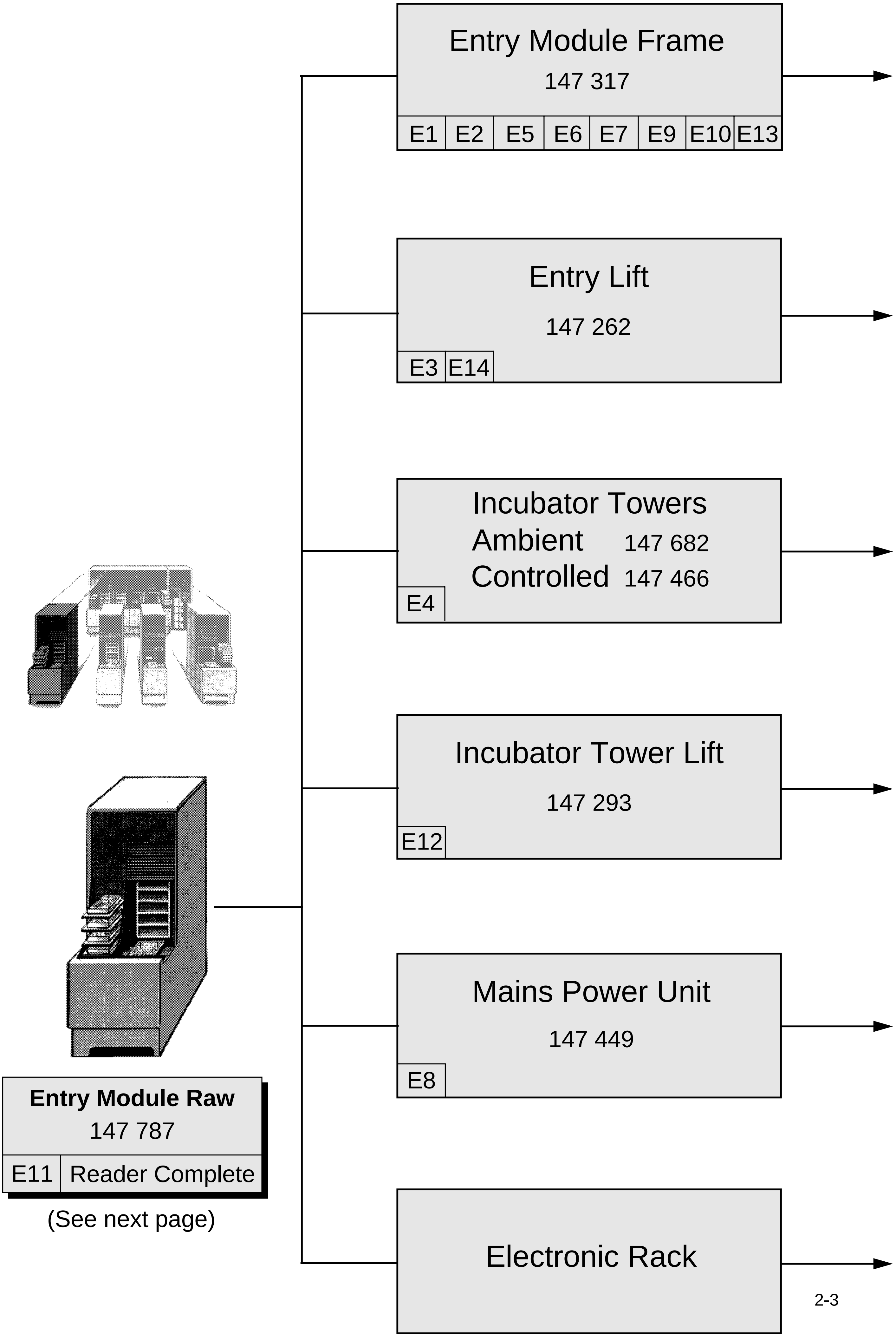
Chromogen is added to visualize the bounded ligand (a colorless substrate which is activated by the enzyme portion of the ligand to produce a colored end product).

❒ Step 8:

Develop plate by incubation.

❒ Step 9:

The amount of test antibody is measured by assessing the amount of colored end product by optical density scanning of the plate.

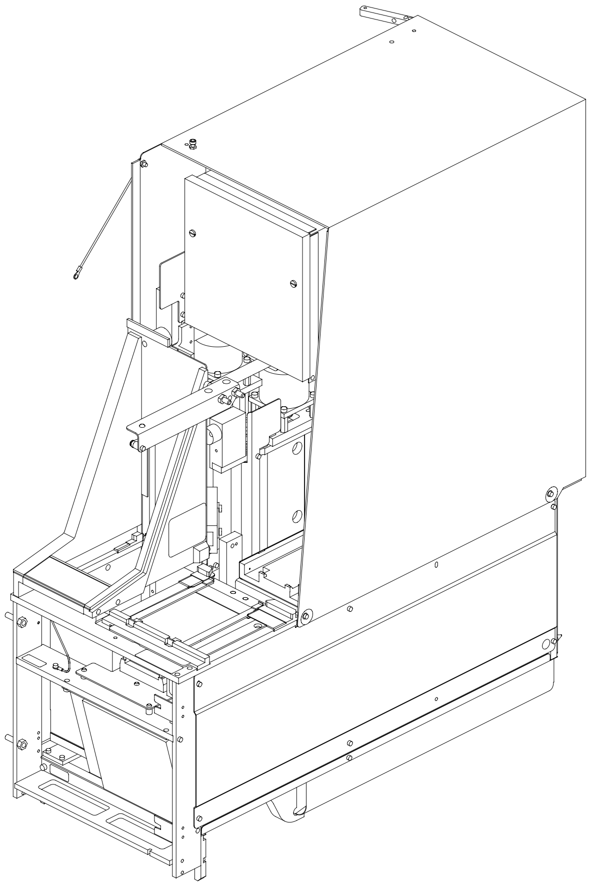

Entry Module Frame
147 317
E1
E2
E5
E6
E7
E9
E10
E13
Entry Lift
147 262
E3
E14
Incubator Towers
Ambient 147 682
Controlled 147 466
E4
Incubator Tower Lift
147 293
E12
Mains Power Unit
147 449
E8
Electronic Rack
Entry Module Raw
147 787
E11
Reader Complete
(See next page)

Entry Module Raw

147 787

- Design
- Wiring Diagram
- Functional Description
  - Entry Module
- Calibration, Adjusting
- Removing Entry Module
- Removing Assemblies
  - Entry Lift
  - Incubator Tower Ambient
  - Incubator Tower Controlled
  - Incubator Tower Lift
  - Main Power Unit
  - Electronic Rack
- Replacing Spare Parts
- Reader Complete p/n 147 897
- Spare Parts List
- 3D Drawing
- Troubleshooting

CHAPTER 2 ENTRY MODULE



2.1 Entry Module Raw 147 787

2.1.1 Design

Refer to the drawings on the following pages:

- ❐ Dwg No. 614 138: Block Diagram Entry Module
- ❐ Dwg No. 147 787: Entry Raw (main assembly)

Block Diagram Entry Module

614.138 revision 00 (VD)

Actors:

SE = Stepper-Motor with integrated Encoder
SM = Stepper-Motor
DM = DC-Motor
HE = Heating Element
PM = Pump Motor
LB = LED blue
LG = LED green
LR = LED red
LY = LED yellow
VA = Valve
FA = FAN (Ventilator)

Sensors:

HS = Hall-Switch
OS = Optical-Switch
TS = Temperature Sensor
MS = Micro-Switch
PS = Pressure Sensor
LS = Liquid Level Sensor
BR = Barcode Reader
OT = Over Temperature Switch
AN = Aspirating Needle
DN = Dispensing Needle

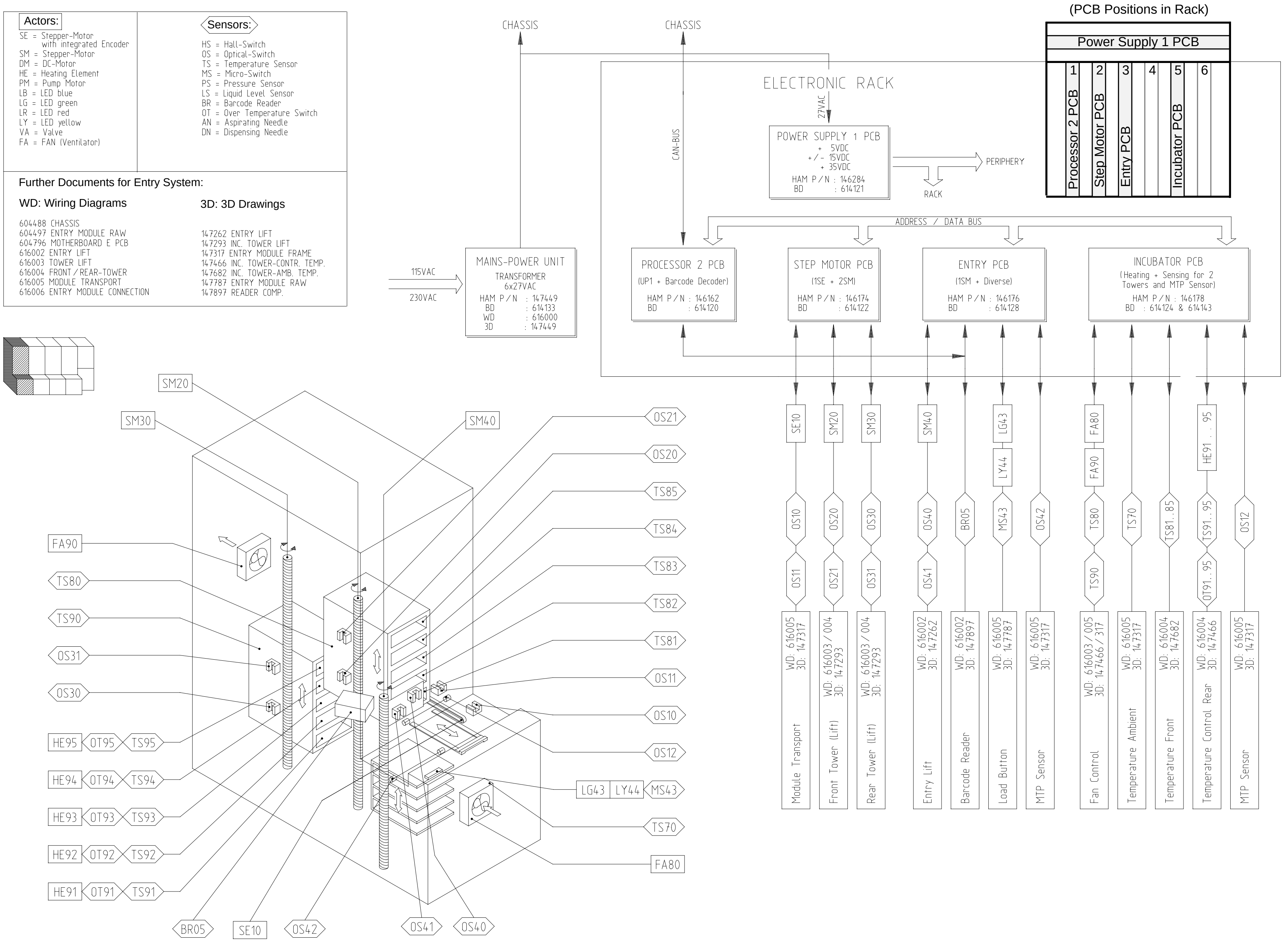
Further Documents for Entry System:

WD: Wiring Diagrams

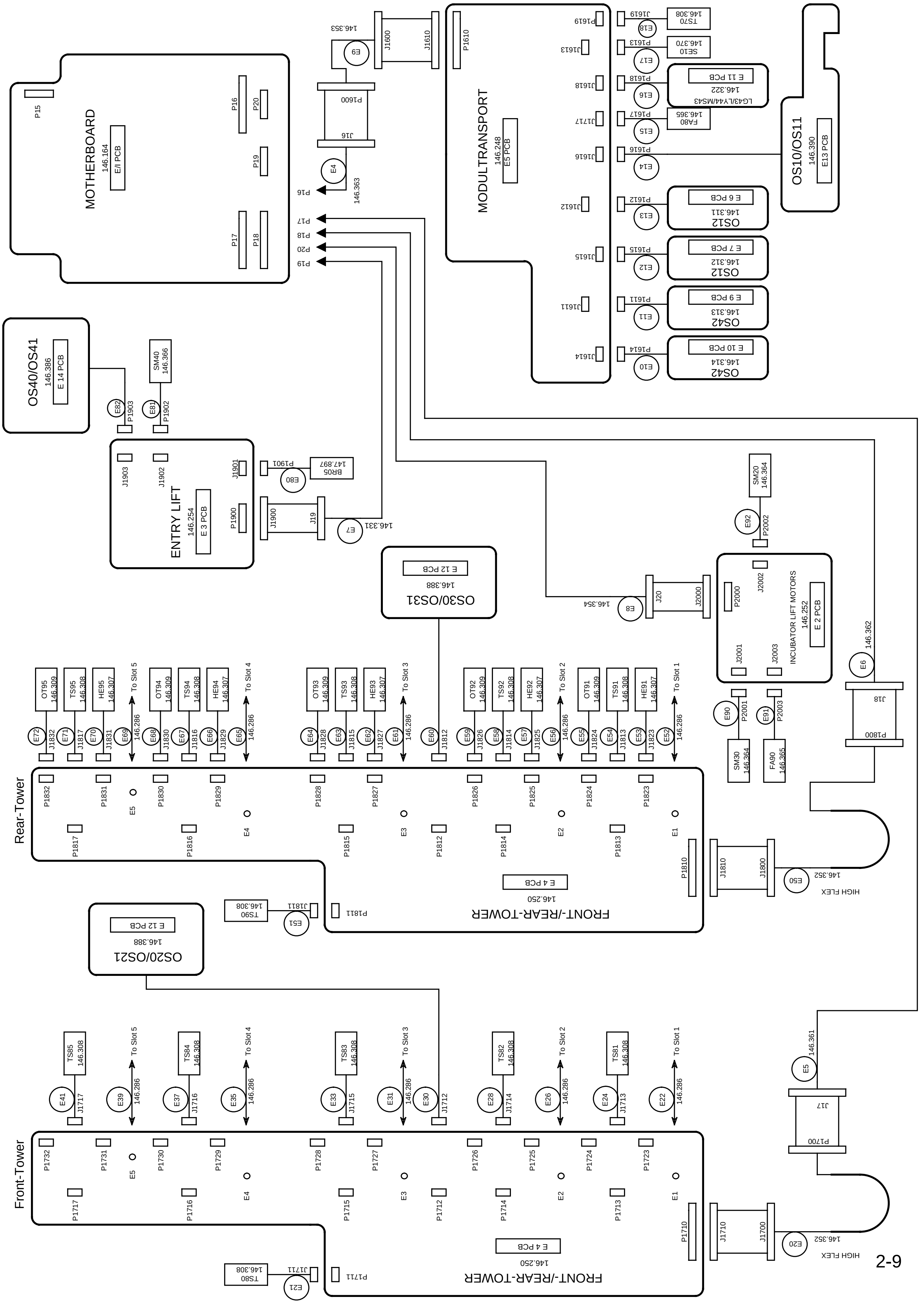
604488 CHASSIS
604497 ENTRY MODULE RAW
604796 MOTHERBOARD E PCB
616002 ENTRY LIFT
616003 TOWER LIFT
616004 FRONT / REAR-TOWER
616005 MODULE TRANSPORT
616006 ENTRY MODULE CONNECTION

3D: 3D Drawings

147262 ENTRY LIFT
147293 INC. TOWER LIFT
147317 ENTRY MODULE FRAME
147466 INC. TOWER-CONTR. TEMP.
147682 INC. TOWER-AMB. TEMP.
147787 ENTRY MODULE RAW
147897 READER COMP.


(PCB Positions in Rack)
Power Supply 1 PCB
1 Processor 2 PCB
2 Step Motor PCB
3 Entry PCB
4
5 Incubator PCB
6
CHASSIS
CHASSIS
ELECTRONIC RACK
27VAC
CAN-BUS
POWER SUPPLY 1 PCB
+ 5VDC
+/- 15VDC
+ 35VDC
HAM P/N : 146284
BD : 614121
PERIPHERY
RACK
ADDRESS / DATA BUS
115VAC
230VAC
MAINS-POWER UNIT
TRANSFORMER 6x27VAC
HAM P/N : 147449
BD : 614133
WD : 616000
3D : 147449
PROCESSOR 2 PCB
(UP1 + Barcode Decoder)
HAM P/N : 146162
BD : 614120
STEP MOTOR PCB
(1SE + 2SM)
HAM P/N : 146174
BD : 614122
ENTRY PCB
(1SM + Diverse)
HAM P/N : 146176
BD : 614128
INCUBATOR PCB
(Heating + Sensing for 2 Towers and MTP Sensor)
HAM P/N : 146178
BD : 614124 & 614143
Actors
Sensors
Function / Diagrams
SE10
OS10
OS11
WD: 616005 3D: 147317
Module Transport
SM20
OS20
OS21
WD: 616003/004 3D: 147293
Front Tower (Lift)
SM30
OS30
OS31
WD: 616003/004 3D: 147293
Rear Tower (Lift)
SM40
OS40
OS41
WD: 616002 3D: 147262
Entry Lift
BR05
WD: 616002 3D: 147897
Barcode Reader
LG43
LY44
MS43
WD: 616005 3D: 147787
Load Button
OS42
WD: 616005 3D: 147317
MTP Sensor
FA80
FA90
TS80
TS90
WD: 616003/005 3D: 147466/317
Fan Control
TS70
WD: 616005 3D: 147317
Temperature Ambient
TS81..85
WD: 616004 3D: 147682
Temperature Front
HE91 .. 95
TS91..95
OT91..95
WD: 616004 3D: 147466
Temperature Control Rear
OS12
WD: 616005 3D: 147317
MTP Sensor
SM20
SM30
SM40
FA90
TS80
TS90
OS31
OS30
HE95 OT95 TS95
HE94 OT94 TS94
HE93 OT93 TS93
HE92 OT92 TS92
HE91 OT91 TS91
BR05
SE10
OS42
OS41
OS40
OS21
OS20
TS85
TS84
TS83
TS82
TS81
OS11
OS10
OS12
LG43 LY44 MS43
TS70
FA80

2.1.2 **Wiring Diagram** Entry Module Raw: 604 497 revision 00


MOTHERBOARD
146.164
E/I PCB
P15
P16
P20
P19
P17
P18
J1600
J1610
P1610
E9
146.353
P1600
J16
E4
146.363
MODULTRANSPORT
146.248
E5 PCB
J1619
P1619
E18
TS70
146.308
J1613
P1613
E17
SE10
146.370
J1618
P1618
E16
E 11 PCB
146.322
LG43/LY44/MS43
J1717
P1617
E15
FA80
146.365
J1616
P1616
E14
OS10/OS11
146.390
E13 PCB
J1612
P1612
E13
E 6 PCB
146.311
OS12
J1615
P1615
E12
E 7 PCB
146.312
OS12
J1611
P1611
E11
E 9 PCB
146.313
OS42
J1614
P1614
E10
E 10 PCB
146.314
OS42
OS40/OS41
146.386
E 14 PCB
SM40
146.366
E82
P1903
E81
P1902
J1903
J1902
J1901
P1901
E80
BR05
147.897
ENTRY LIFT
146.254
E 3 PCB
P1900
J1900
J19
E7
146.331
OS30/OS31
146.388
E 12 PCB
SM20
146.364
E92
P2002
J2002
E8
146.354
J20
J2000
P2000
INCUBATOR LIFT MOTORS
146.252
E 2 PCB
J2001
J2003
146.362
E6
J18
P1800
E90
P2001
E91
P2003
SM30
146.364
FA90
146.365
OT95
146.309
TS95
146.308
HE95
146.307
To Slot 5
OT94
146.309
TS94
146.308
HE94
146.307
To Slot 4
OT93
146.309
TS93
146.308
HE93
146.307
To Slot 3
OT92
146.309
TS92
146.308
HE92
146.307
To Slot 2
OT91
146.309
TS91
146.308
HE91
146.307
To Slot 1
E72
J1832
E71
J1817
E70
J1831
E69
146.286
E68
J1830
E67
J1816
E66
J1829
E65
146.286
E64
J1828
E63
J1815
E62
J1827
E61
146.286
E60
J1812
E59
J1826
E58
J1814
E57
J1825
E56
146.286
E55
J1824
E54
J1813
E53
J1823
E52
146.286
Rear-Tower
P1832
P1831
E5
P1830
P1829
E4
P1828
P1827
E3
P1826
P1825
E2
P1824
P1823
E1
P1817
P1816
P1815
P1812
P1814
P1813
P1810
J1810
J1800
E50
146.352
HIGH FLEX
E 4 PCB
146.250
FRONT-/REAR-TOWER
P1811
J1811
TS90
146.308
E51
OS20/OS21
146.388
E 12 PCB
146.361
E5
J17
P1700
TS85
146.308
To Slot 5
TS84
146.308
To Slot 4
TS83
146.308
To Slot 3
TS82
146.308
To Slot 2
TS81
146.308
To Slot 1
E41
J1717
E39
146.286
E37
J1716
E35
146.286
E33
J1715
E31
146.286
E30
J1712
E28
J1714
E26
146.286
E24
J1713
E22
146.286
Front-Tower
P1732
P1731
E5
P1730
P1729
E4
P1728
P1727
E3
P1726
P1725
E2
P1724
P1723
E1
P1717
P1716
P1715
P1712
P1714
P1713
P1710
J1710
J1700
E20
146.352
HIGH FLEX
E 4 PCB
146.250
FRONT-/REAR-TOWER
P1711
J1711
TS80
146.308
E21

2.1.3 Functional Description Entry Module

The main functions of the Entry Module are:

- ❐ Entry stack loading for 4 microtiter plates
- ❐ Plate identification with barcodes
- ❐ Incubation tower ambient temperature (5 incubator slots)
- ❐ Incubation tower temperature-controlled (5 incubator slots) up to 45 °C.
- ❐ Electronic Rack

For further information consult the User Manual section 2.3.

2.1.4 Calibration, adjusting

2.1.5 Removing Entry Module

Remove transparent cover, upper front, hardtop, main shuttle rail, cover mains power, left side front (see section 1.1.5.3.2).

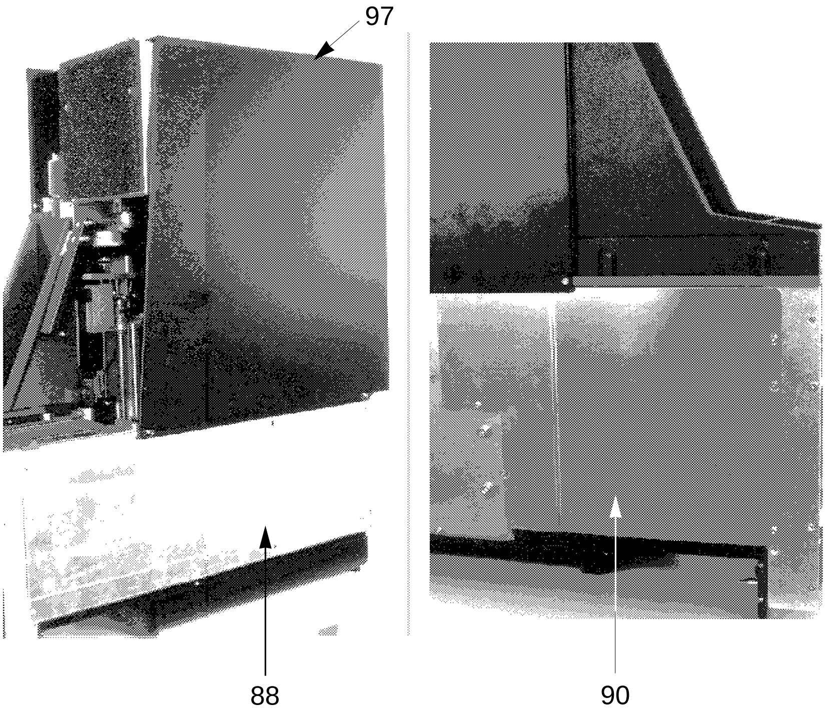
Remove entry module (see section 1.1.5.3.3).

2.1.6 Removing Assemblies

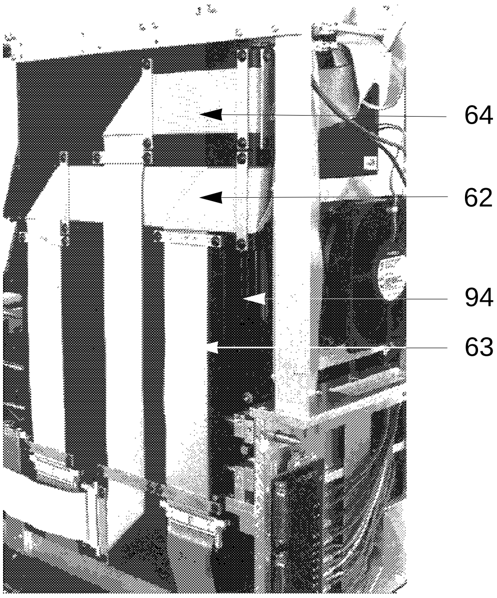
NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

Some of the following items must be removed to replace spare parts:

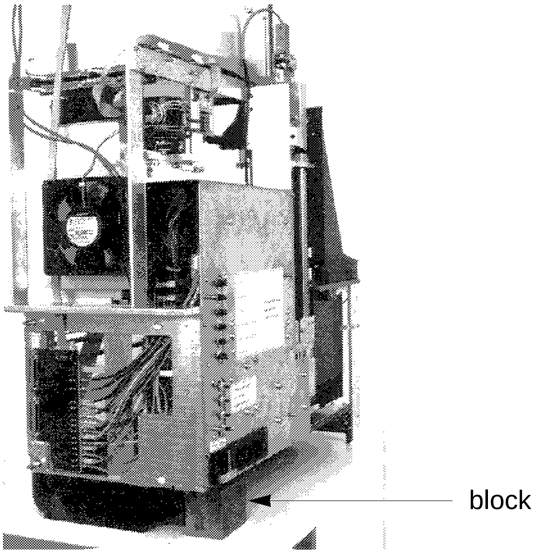
-	Hood	item 97
-	Side cover left	item 90
-	Side cover right	item 88
-	Cable support plate	item 94



Before unscrewing and removing cable support plate item 94 first disconnect both ends of cables E4 item 64, E5 item 62 and E6 item 63.



ATTENTION
The Entry module may fall over after the Entry Lift and the Incubator Tower Lift have been removed. Support the Entry module using the block (P/N 148 339 Support Entry Module Block) as shown below.

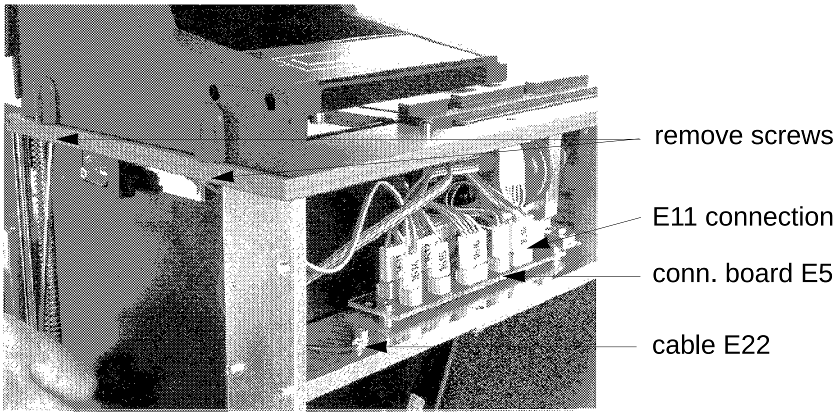


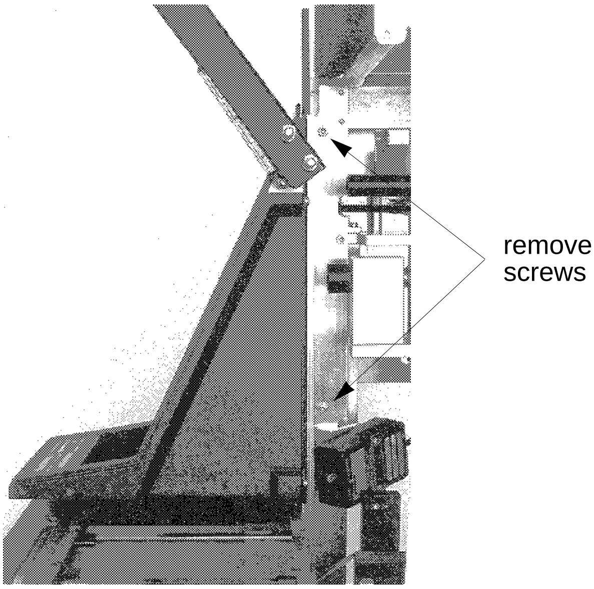
2.1.6.1 Entry lift item 2

Remove *hood item 97* and *side cover left item 90* (see section 2.1.6).

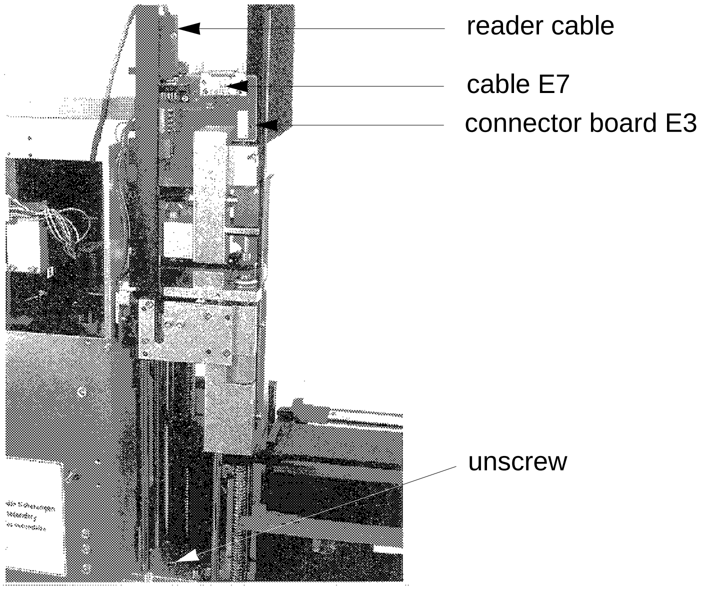
Disconnect connector board E11 PCB from connector board E5 PCB and unscrew ground cable E22 from chassis.

Unscrew and remove entry stack housing (4 screws).

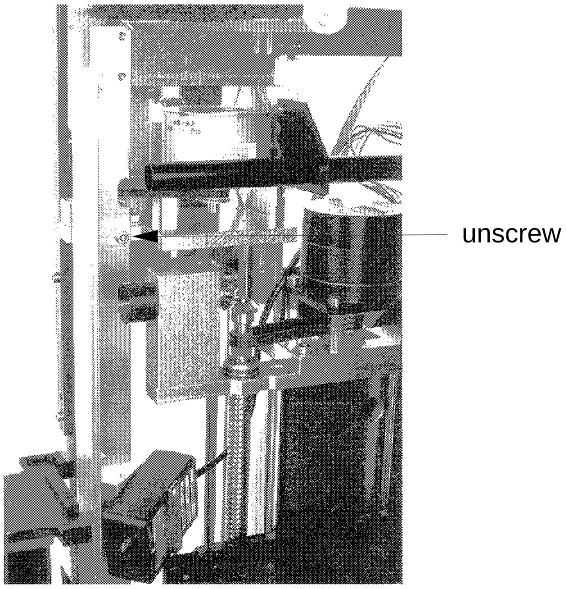

remove screws
E11 connection
conn. board E5
cable E22


remove
screws

Disconnect reader and cable E7 from connector board E3 PCB.


reader cable
cable E7
connector board E3
unscrew

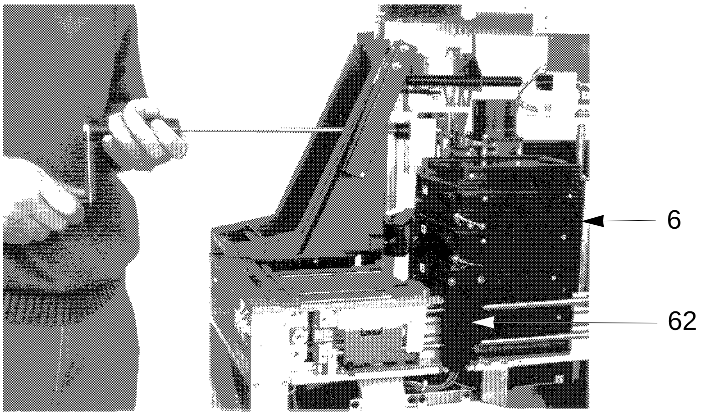
Unscrew entry lift and lift it off the module.



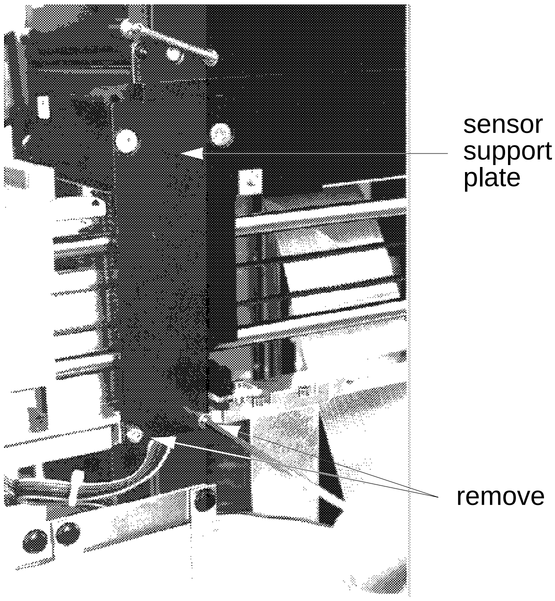
2.1.6.2 Inc. tower - amb. temp. item 6, Inc. tower - contr. temp. item 5 and Inc. tower lift item 3

Remove *hood item 97*, *side cover right item 88* and *cable support plate item 94* (see section 2.1.6).

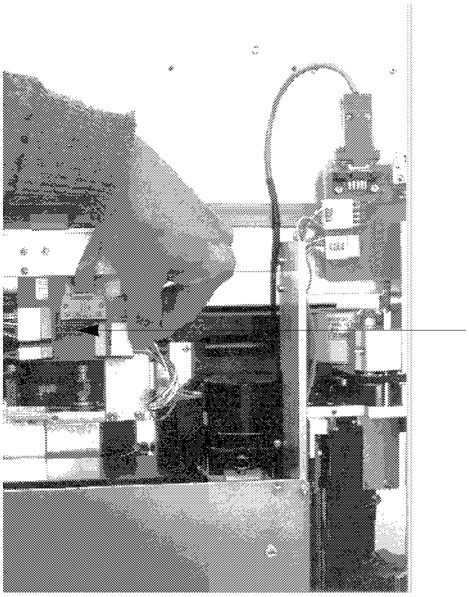
Wind the ambient inc. tower all the way up with the height mover tool.



Remove sensor support plate (item 62 of Entry frame 147 317) (two screws).

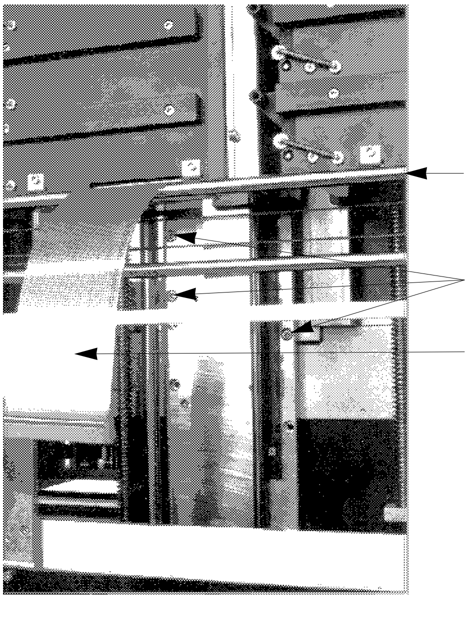


Disconnect the motor from connector board E2.

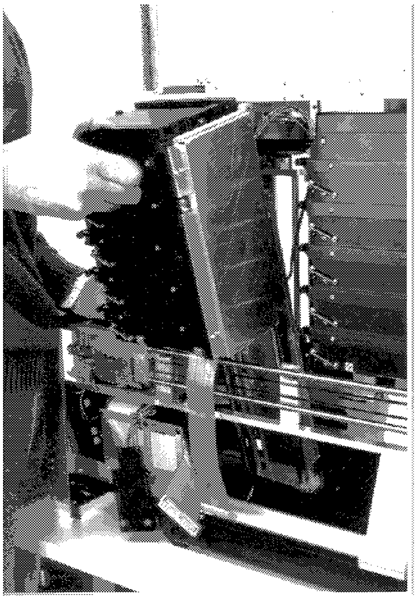

connector
board E2

Put cable E20 over upper *linear guide shaft (item 29 of Entry raw)*.

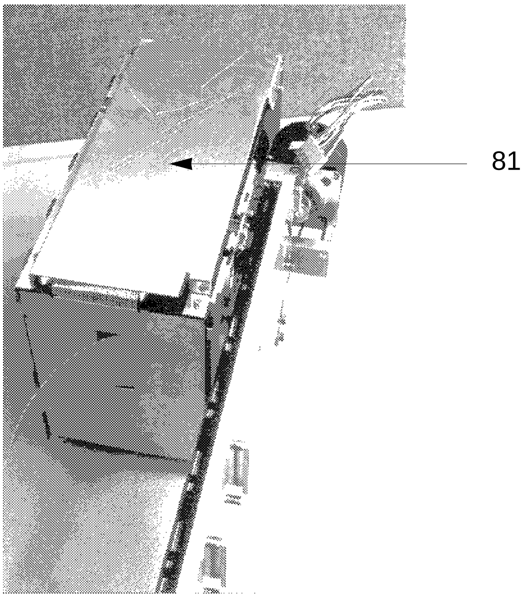
Remove the three incubator tower fixing *screws item 203*.


upper linear
guide shaft
203
cable E20

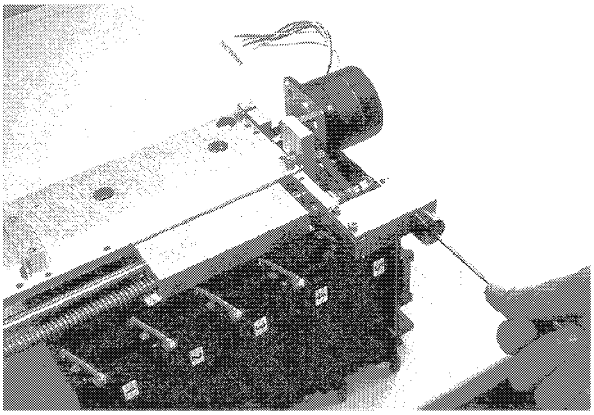
Carefully remove incubator tower.



Remove *cable cover plate item 81*.

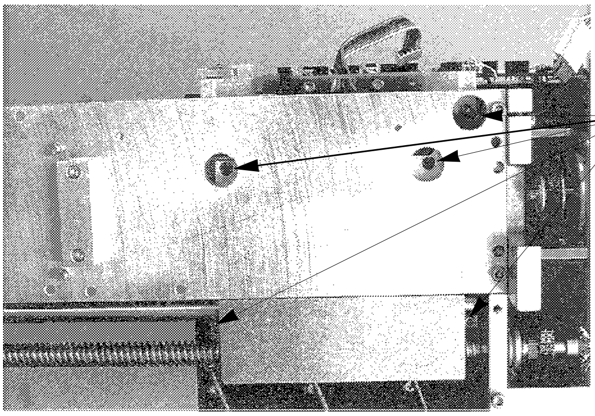


Using an Allen type screwdriver (size 3), move the incubator tower lift until the fixing screws are accessible through the two holes.



Disconnect *connector board E12 PCB* from connector board E4.

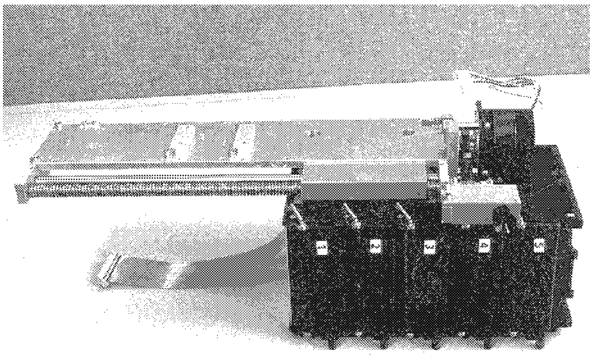
Place the assembly so that the lift is facing up.



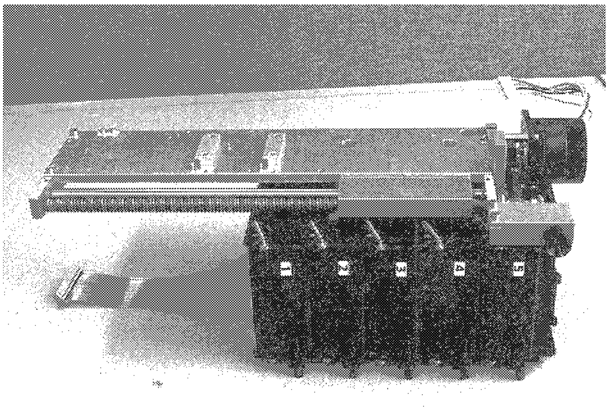
Unscrew incubator tower lift (5 screws) and remove.

Remounting:

Position of lift with ambient tower.



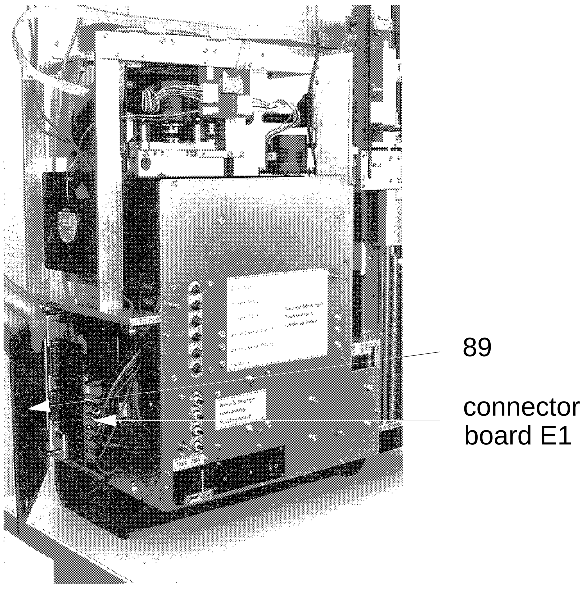
Position of lift with controlled tower.



2.1.6.3 Mains power unit item 7

Remove *hood item 97* and *side cover left item 90* (see section 2.1.6).

Remove *rear cover plate item 89*.



Disconnect the 12 cables from connector board E1 PCB.

Unscrew (8 screws) and remove the mains power unit.

Remounting: Wire codes for connector board E1 PCB are shown below.

br	=	brown
ro	=	red
or	=	orange
ge	=	yellow
gr	=	green
bl	=	blue

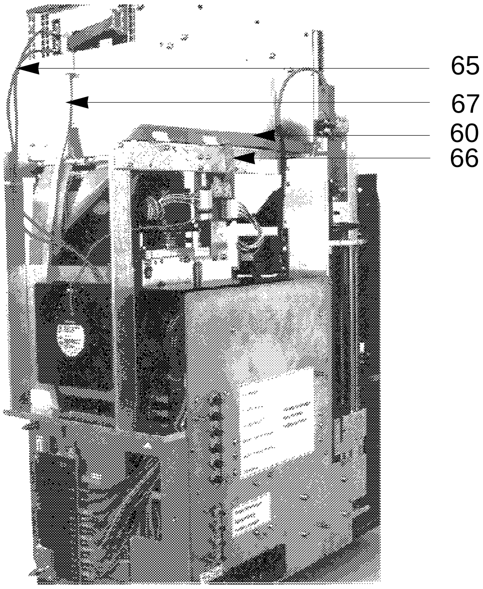
2.1.7 Replacing spare parts

NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

2.1.7.1 Cables E1 item 67, E2 item 65, E7 item 60, and E8 item 66

Remove *hood item 97* (see section 2.1.6).

For cables E1 and E2 first remove *rear cover plate item 89*.

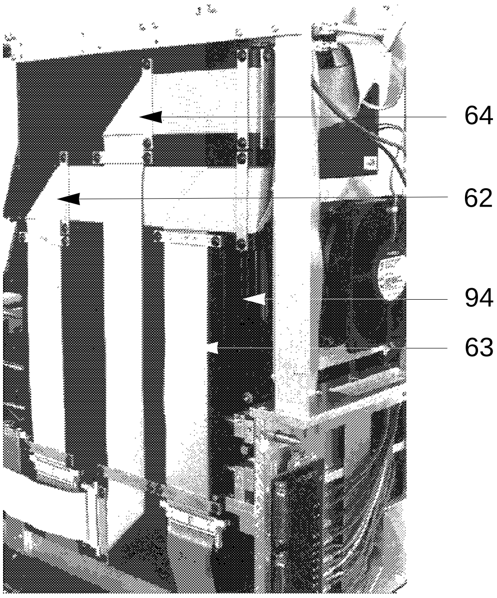


2.1.7.2 Cables E4 item 64, E5 item 62 and E6 item 63

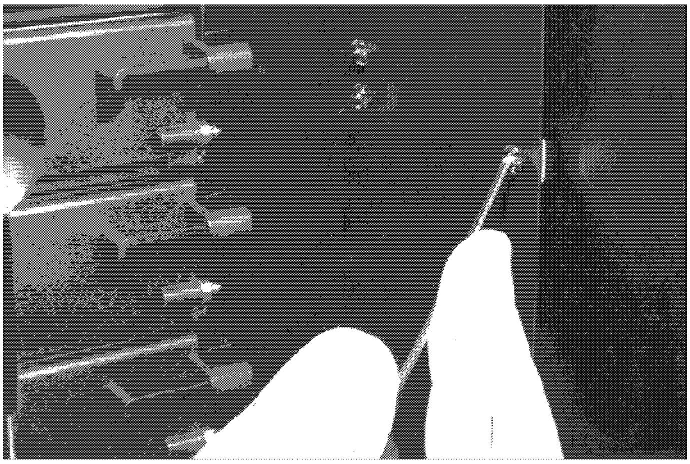
Remove *hood item 97* (see section 2.1.6).

Disconnect both ends of each cable.

Unscrew and remove *cable support plate item 94.*



To remove the *expanding rivet item 170*, push in central pin as shown in the following picture.



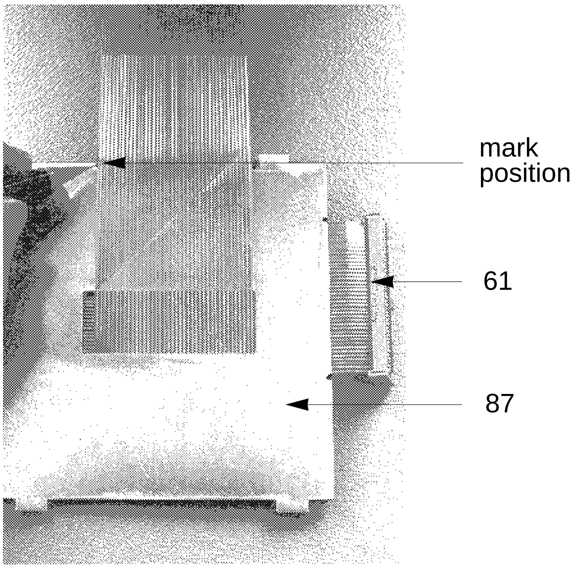
2.1.7.3 Cable E20 item 61

Remove corresponding inc. tower and inc. tower lift (see section 2.1.6.2 Inc. tower - amb. temp. item 6, Inc. tower - contr. temp. item 5 and Inc. tower lift item 3). Do ***not*** detach the lift from the tower.

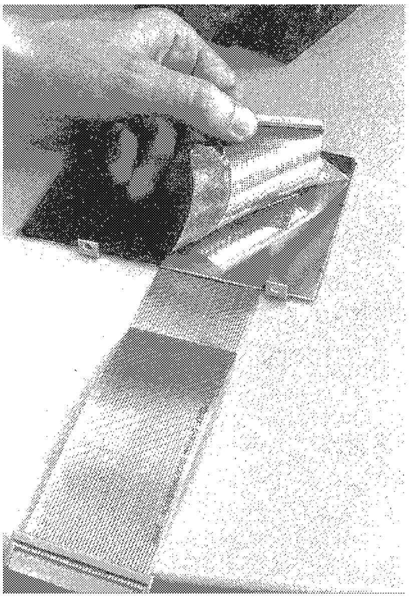
Remove *cable cover plate item 81*.

Remove *tower bottom plate item 87* incl. cable E20.

On *tower bottom plate item 87*, mark position of cable E20 (see following picture).



Peel off *insulation pad item 80* and cable E20.

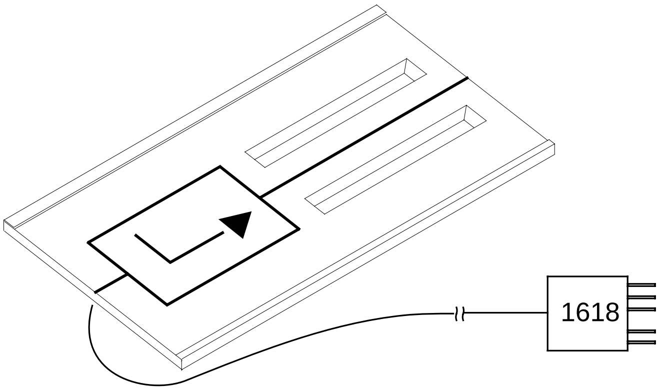


Fold the new cable E20 the same way as the old cable.

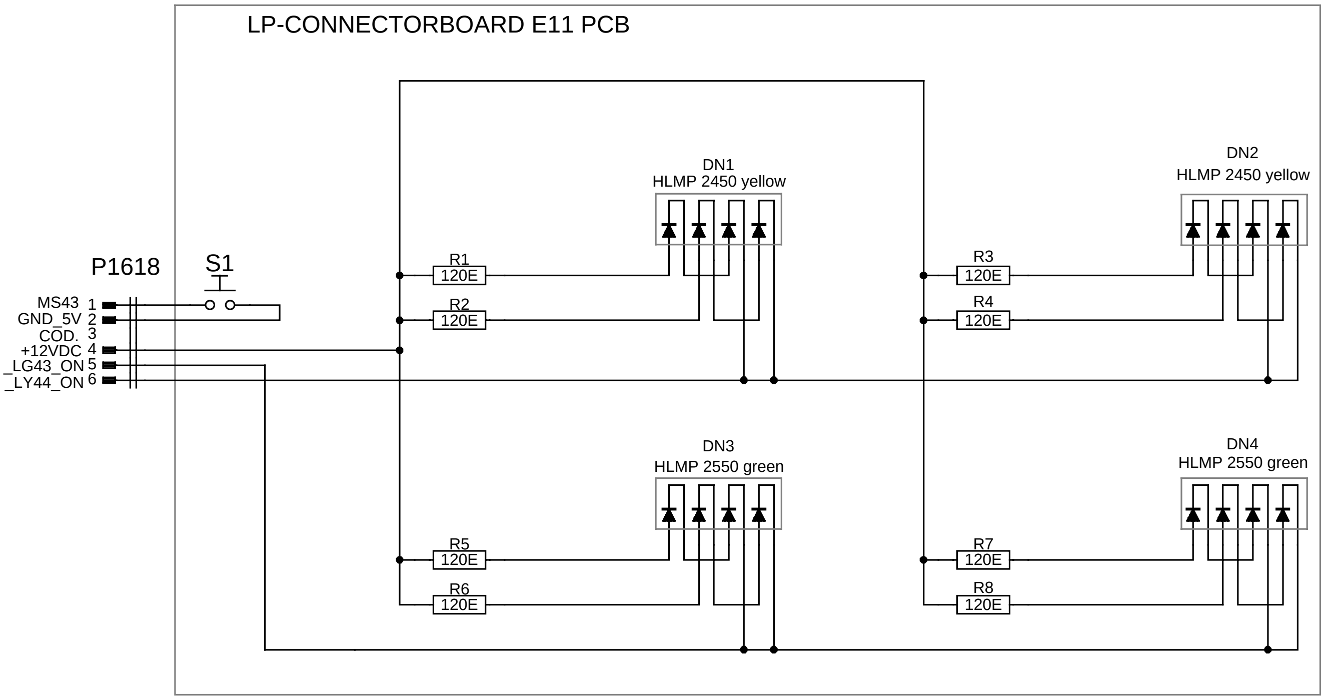
Use a new *insulation pad item 80* to attach the new cable E20 to the tower bottom plate

Remount in reverse order.

2.1.7.4 Connector board E11 item 39 & cable E22 item 68



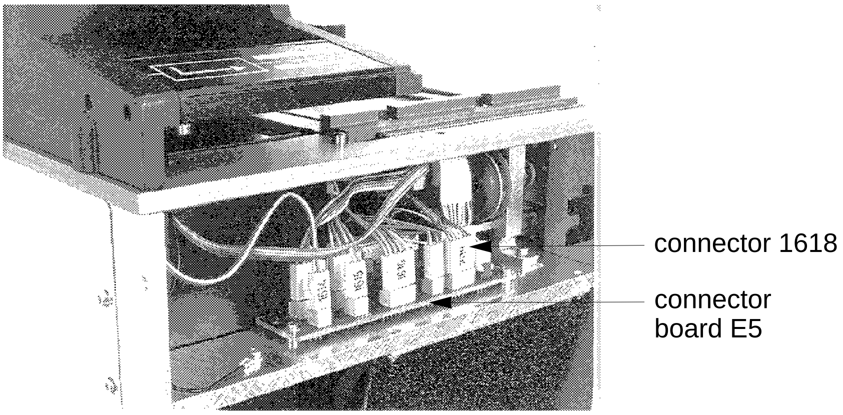
Connector Board E11 PCB Wiring Diagram 604.848 revision 99


LP-CONNECTORBOARD E11 PCB
P1618
S1
MS43 1
GND_5V 2
COD. 3
+12VDC 4
_LG43_ON 5
_LY44_ON 6
R1 120E
R2 120E
R3 120E
R4 120E
R5 120E
R6 120E
R7 120E
R8 120E
DN1
HLMP 2450 yellow
DN2
HLMP 2450 yellow
DN3
HLMP 2550 green
DN4
HLMP 2550 green

The Entry module must NOT be removed from chassis in order to replace these two parts!

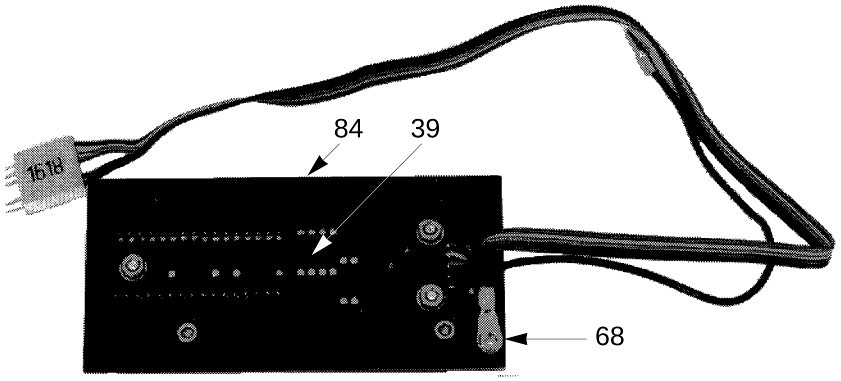
Remove *left side front* and *cover mains power* (see section 1.1.5.3.2).

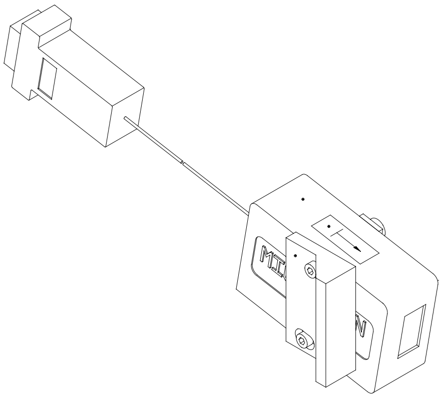
Disconnect plug 1618 from connector board E5 and unscrew the *ground cable E22 item 68*.


connector 1618
connector board E5

Unscrew and remove the *frame (item 84)* complete with connector board E11 (item 39).

Remove the 4 screws holding item 39 to the frame (item 84) and replace connector board E11.


84
39
16.18
68



2.1.8 Reader complete p/n 147 897

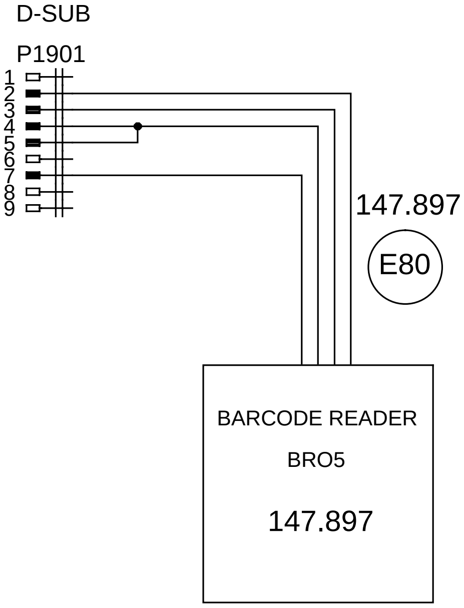
2.1.8.1 Functional Description

The function of the plate barcode reader is to identify barcodes on the plates. This information is used to control the position of the plate within the instrument (under the assumption that only **one** barcode is present on the plate and that it is in the correct position). Barcode information is also used to select the method to be carried out.

After reading, the plate is transported automatically to the defined modules for processing (e.g. incubator, washer etc.) according to the selected method.

2.1.8.2 Wiring Diagram Reader Complete

Drawing 147 897 revision 00 (also see wiring diagram entry lift 616 002)



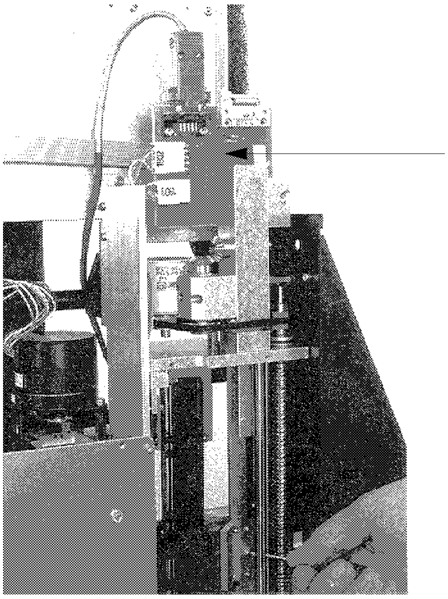
2.1.8.3 Replacing reader complete item 7

Remove hood (see section 2.1.6)

Lower the front incubator tower.

Disconnect the reader from connector board E3.

Unscrew the reader (1 screw) and remove.



connector board E3

Remount in reverse order.

2.1.9 Spare Parts List

ENTRY MODULE RAW 147787 Revision: 01

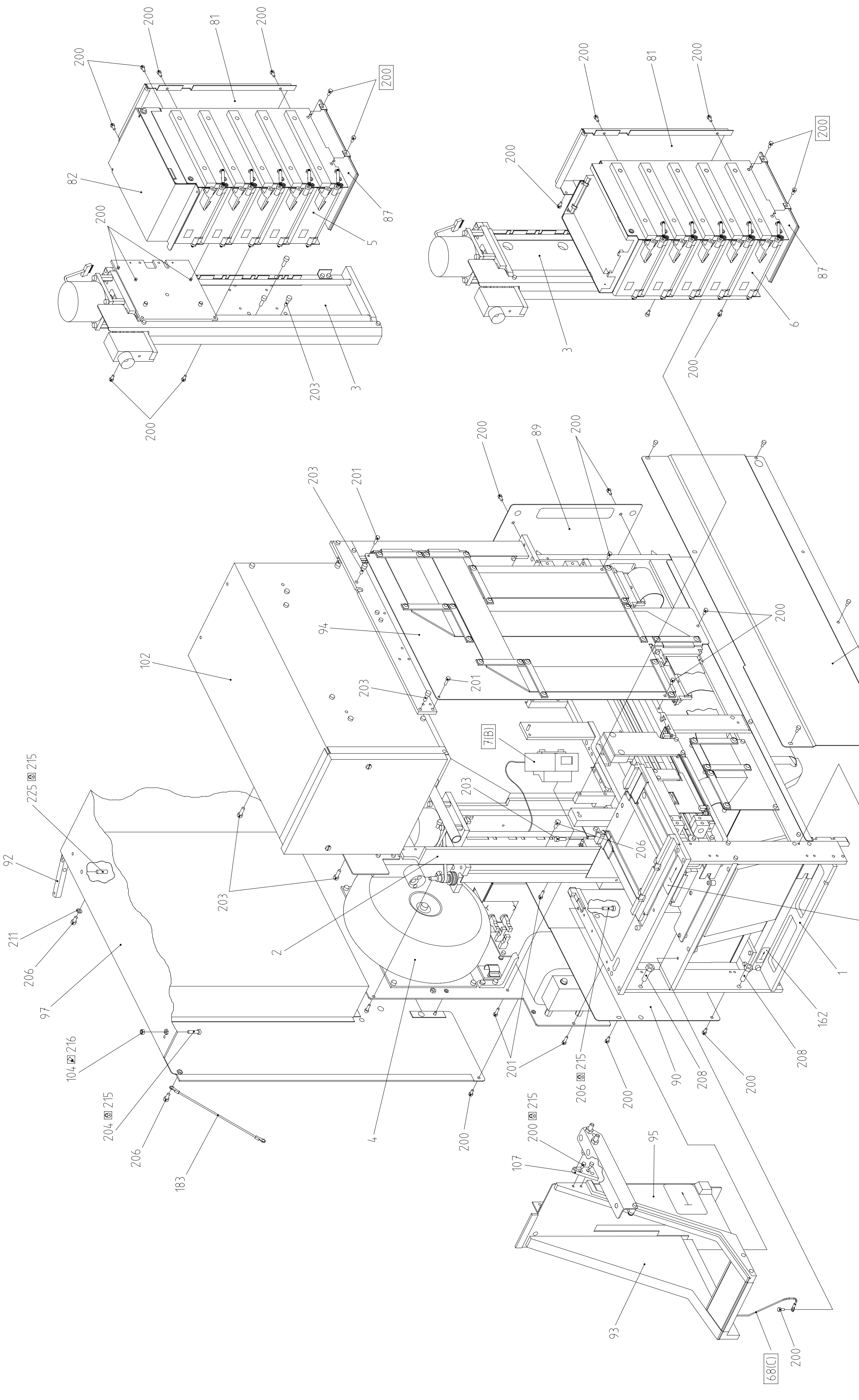
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147317	ENTRY-MODUL FRAME	00	1	1.000	
147262	ENTRYLIFT	01	2	1.000	B
147293	INC. TOWER LIFT	00	3	2.000	B
147449	MAINS POWER UNIT	00	4	1.000	
147466	INC. TOWER - CONTR. TEMP.	00	5	1.000	
147682	INC.TOWER-AMB.TEMP.	00	6	1.000	
147897	READER COMP.	00	7	1.000	B
146164	MOTHERBOARD E PCB	01	20	1.000	C
146162	PROCESSOR 2 PCB	01	21	1.000	
146174	STEP MOTOR PCB	00	22	1.000	A
146176	ENTRY PCB	03	23	1.000	
146178	INKUBATOR PCB	02	24	1.000	A
146284	POWER SUPPLY 1 PCB	04	25	1.000	A
146322	CONNECTORBOARD E11 PCB	00	39	1.000	A
146242	EL. RACK FAN	00	40	1.000	B
146331	CABLE E7	00	60	1.000	
146352	CABLE E20	00	61	2.000	A
146361	CABLE E5	00	62	1.000	
146362	CABLE E6	00	63	1.000	
146363	CABLE E4	00	64	1.000	
146330	CABLE E2	00	65	2.000	
146354	CABLE E8	00	66	1.000	
146329	CABLE E1	00	67	1.000	
146286	CABLE E22	00	68	1.000	C
147946	SCHARNIER	00	79	2.000	C
148354	KAMMERISOLIERMATTE	00	80	2.000	
147481	KABELSCHUTZ	00	81	2.000	
147484	KAMMERDACH	00	82	1.000	
147487	KAMMERWAND	00	83	1.000	
147637	RAHMEN	00	84	1.000	
147645	MITNEHMER	00	85	2.000	
147654	SCHARNIERWELLE	00	86	1.000	
147657	TOWERBODENBLECH	00	87	2.000	
147789	SEITENBLECH RECHTS	00	88	1.000	
147791	RUECKWANDBLECH	00	89	1.000	
147792	SEITENBLECH LINKS	00	90	1.000	
147793	BOLZEN	00	91	2.000	
147794	TUERANGEL	00	92	1.000	
148194	STACKWAND LINKS LACKIERT	00	93	1.000	
147796	KABELFUEHRUNG 1	00	94	1.000	
148195	STACKWAND RECHTS LACKIERT	00	95	1.000	
147798	STACKRUECKWAND	00	96	1.000	
147803	HAUBE ENTRY MODUL	00	97	1.000	
147893	GASFEDER-HALTER LINKS	00	98	1.000	
147894	LAGERUNG	00	99	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147895	GASFEDER-BEFESTIGUNG 1	00	100	1.000	
147896	GASFEDER-BEFESTIGUNG 2	00	101	1.000	
147824	EL.RACK GEHAEUSE	01	102	1.000	
147994	EL.RACK RUECKWAND	00	103	1.000	
148346	UNTERLAGE	00	104	1.000	
147638	KABELKLEMME	00	105	13.000	A
148160	GASFEDERHALTER	00	107	1.000	
255086	LABEL PCB-POS. ENTRY-MODULE	00	160	1.000	
255096	KLEBER KABEL-POS ENTRY-MODULE	00	161	1.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	162	1.000	
255056	WARNZ. LASER-STRAHLUNG	00	163	1.000	
422002	SPREIZNIETE KST D=5 KB=3.5-4.5	00	170	26.000	A
253007	SINTERBZ LAG.3E7/6r7/9 2.5+1.5	00	171	2.000	
256500	GAS-FEDER	00	172	1.000	C
361036	KABELHALTER	00	180	2.000	
361004	KABELBEF. CFCC-4 1/2”	00	181	3.000	
279329	PUFFER D = 6,5 X 1,6 TRANSP	00	182	1.000	A
146404	CABLE E150	00	183	1.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	200	43.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	201	32.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	203	12.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	204	1.000	
420085	ZYL-SCHR.M 4X18 DIN912 A2	00	205	2.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	206	15.000	
408032	SECHSKANTMUTTER M6 VSM13753	00	207	2.000	
420333	GEW. STIFT A2 M6X30	00	208	2.000	
403491	SENKSCHRAUBE M 4X 8 DIN7991	00	210	2.000	
409006	U-SCHEIBE M4 DIN433	00	211	2.000	
409402	PA-SCHEIBE M5 DIN125A BN 1074	00	212	1.000	
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	213	5.000	
7279460	MOOSGUMMI RUND d= 8 EPDM	00	214	0.210	
511006	LOCTITE 222 50mL	00	215	0.000	T
511010	LOCTITE 638 50mL	00	216	0.000	T
7279267	KANTENSCHUTZ SCHLITZ B= 1,0	00	217	0.040	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	218	3.000	
254121	O-RING 79X2 NBR 70.5/P5	00	219	1.000	A
511030	SICOMET 77	00	220	0.000	
255042	WARNZ. BIOGEFAEHRDUNG	00	223	1.000	
405088	GEW.STIFT M5x16 DIN 913	00	225	1.000	
608297	Q-BESCHEINIGUNG ENTRY MOD.	01	250	1.000	
608302	TECHN. STAND ENTRY MOD.	01	251	1.000	
309075	TEMP. INDIKATOR SELBSTK.	00	300	10.000	

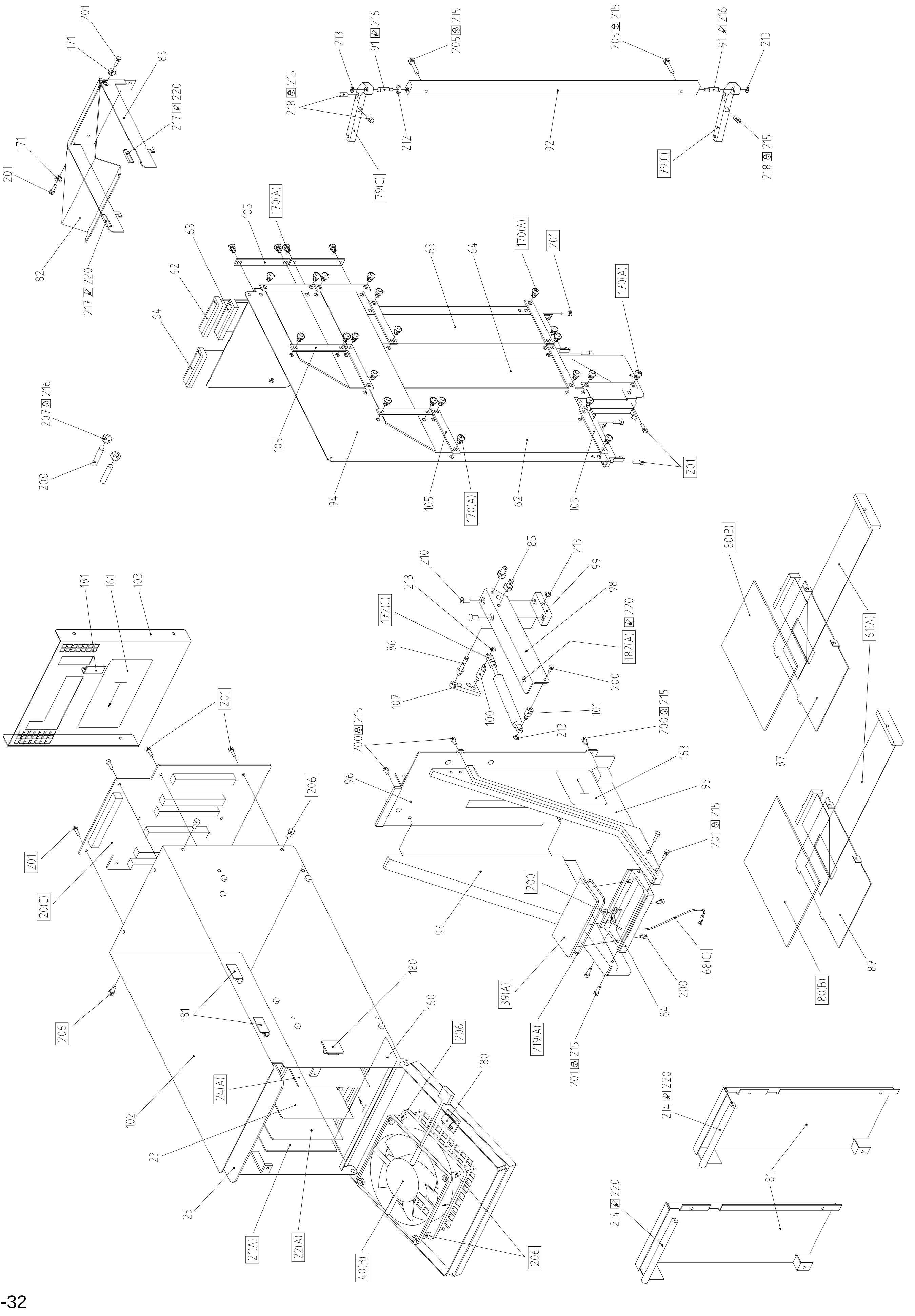
2.1.10 3D Drawings

Next two pages

Entry Module Raw 147787/2 revision 00

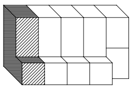

200
200
81
200
200
82
87
5
200
203
3
200
200
81
200
200
200
87
6
3
200
200
89
200
203
201
94
102
203
201
88
200
200
7(B)
203
206
225 ⊠ 215
92
211
206
97
203
2
4
223
1
162
208
104 ⊠ 216
204 ⊠ 215
206
183
200
201
206 ⊠ 215
200
90
208
200
200 ⊠ 215
107
95
93
68(C)
200

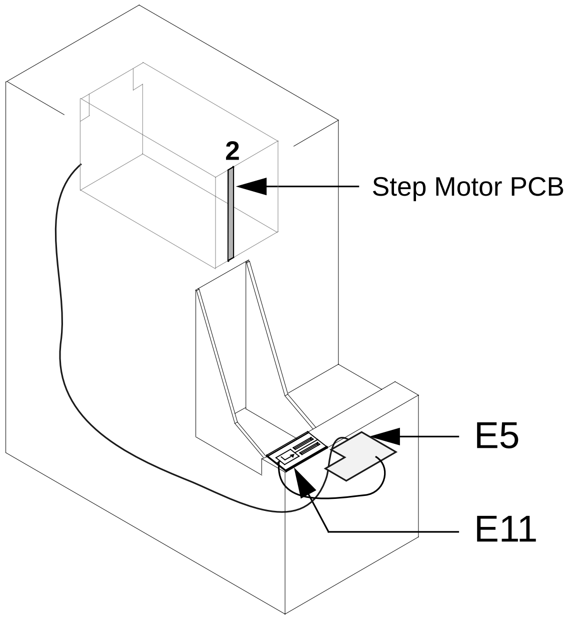
Entry Module Raw 147787/1 revision 00

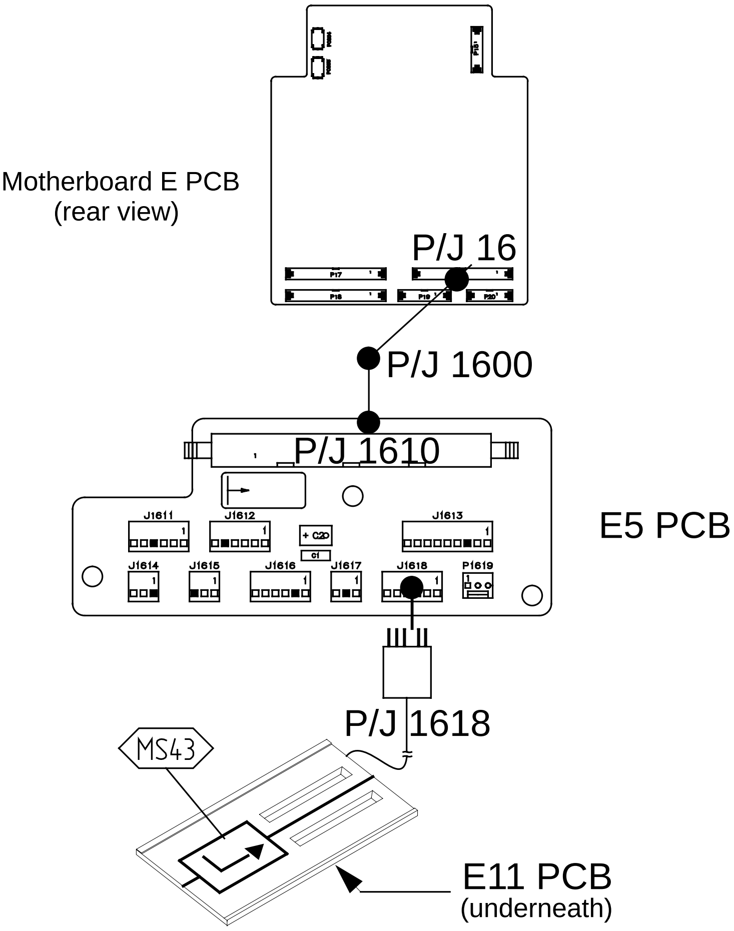

201
171
83
217 220
171
201
82
217 220
213
91 216
205 215
218 215
212
79(C)
92
205 215
91 216
213
79(C)
218 215
105
170(A)
63
62
64
63
64
170(A)
201
170(A)
105
94
105
170(A)
62
105
201
207 216
208
181
161
103
201
201
20(C)
206
206
102
181
180
160
24(A)
23
25
21(A)
22(A)
40(B)
206
180
206
210
213
172(C)
86
107
100
85
213
99
98
182(A) 220
200
101
213
200 215
200 215
96
163
95
93
201 215
200
39(A)
219(A)
201 215
84
200
68(C)
80(B)
61(A)
87
87
80(B)
214 220
81
214 220
81

2.1.11 Troubleshooting

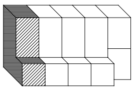
Module: Entry
Assembly: Raw
Sensor: Micro-Switch MS43 Load Button
Boards: E5, E11, Step Motor PCB
Motherboard E
Error Message:

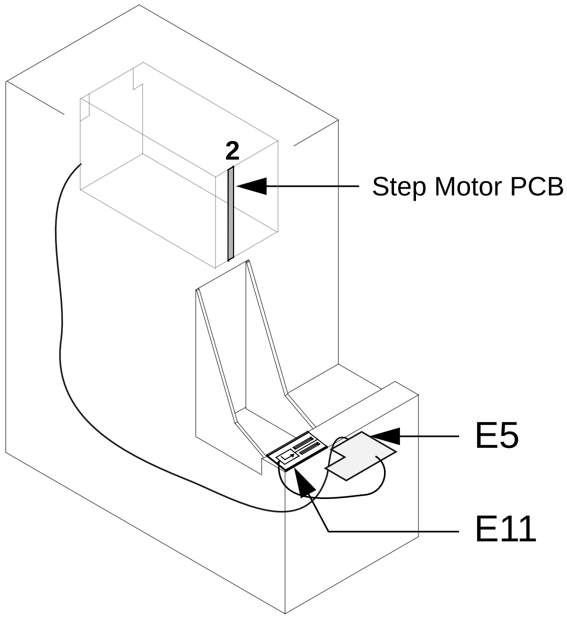


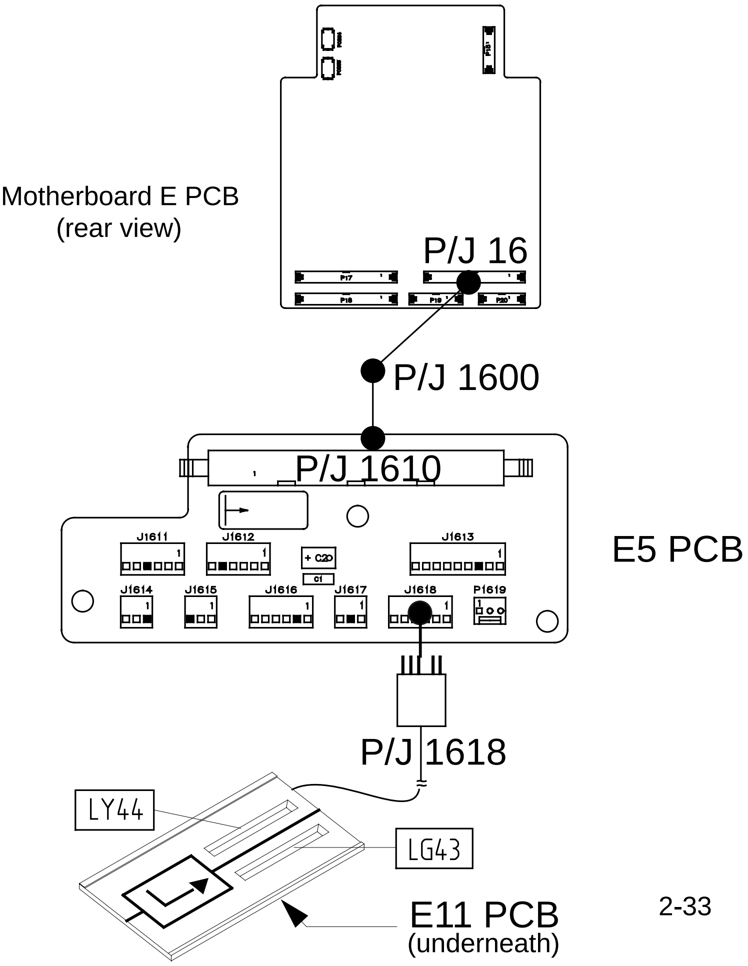

2
Step Motor PCB
E5
E11


Motherboard E PCB
(rear view)
P/J 16
P17
P18
P19
P20
P/J 1600
P/J 1610
E5 PCB
J1611
J1612
J1613
C20
C1
J1614
J1615
J1616
J1617
J1618
P1619
P/J 1618
MS43
E11 PCB
(underneath)

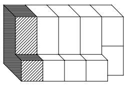
Module: Entry
Assembly: Raw
Actors: Signal Lamps, LED Yellow LY44
LED Green LG43
Boards: E5, E11, Step Motor PCB
Motherboard E
Error Message:

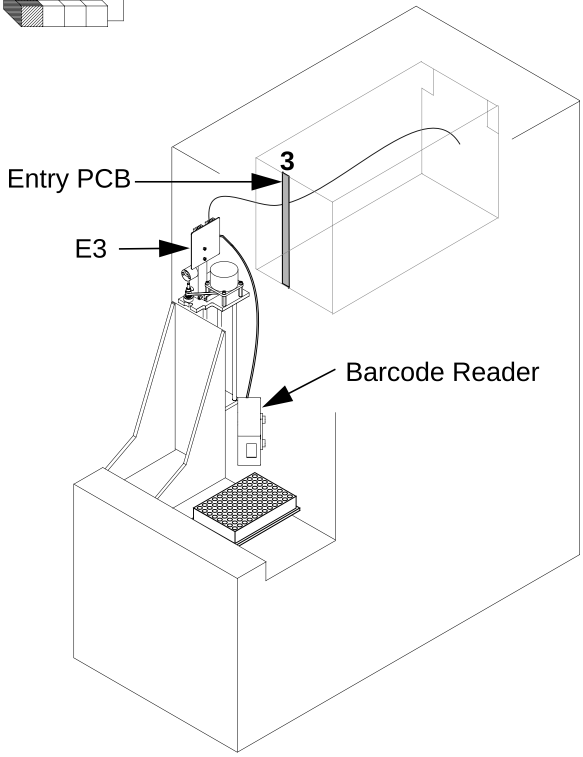


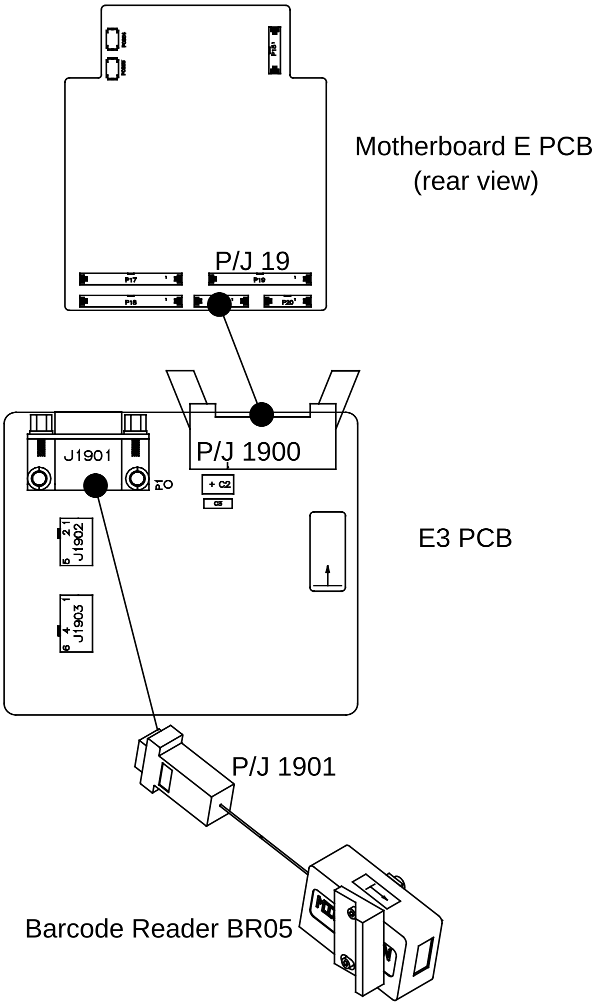

2
Step Motor PCB
E5
E11


Motherboard E PCB
(rear view)
P/J 16
P17
P18
P19
P20
P/J 1600
P/J 1610
E5 PCB
J1611
J1612
J1613
C20
C1
J1614
J1615
J1616
J1617
J1618
P1619
P/J 1618
LY44
LG43
E11 PCB
(underneath)

Module:	Entry
Assembly:	Entry Raw
Sensor:	Barcode Reader BR05
Boards:	E3, Entry PCB Motherboard E
Error Message:	




Entry PCB
3
E3
Barcode Reader


Motherboard E PCB
(rear view)
P/J 19
P17
P18
P19
P20
P/J 1900
J1901
P1
C2
C3
J1902
J1903
E3 PCB
P/J 1901
Barcode Reader BR05

Entry Module Frame

147 317

Functional Description

Connector Boards

E1	146 154
E2	146 252
E5	146 248
E6	146 311
E7	146 312
E9	146 313
E10	146 314
E13	146 390

Block Diagram

MTP Sensor

Wiring Diagram

Module Transport Assembly

Replacing Spare Parts

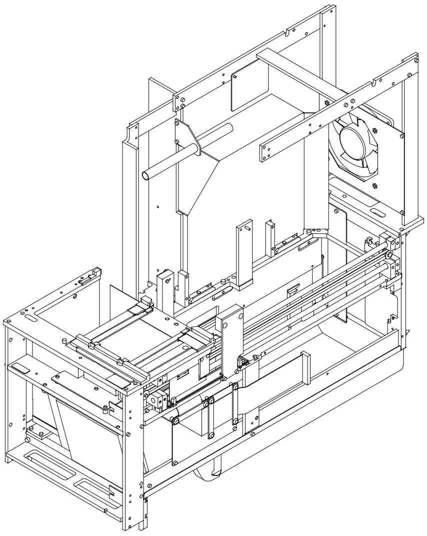
Reader Complete

147 897

Spare Parts List

3D Drawing

Troubleshooting

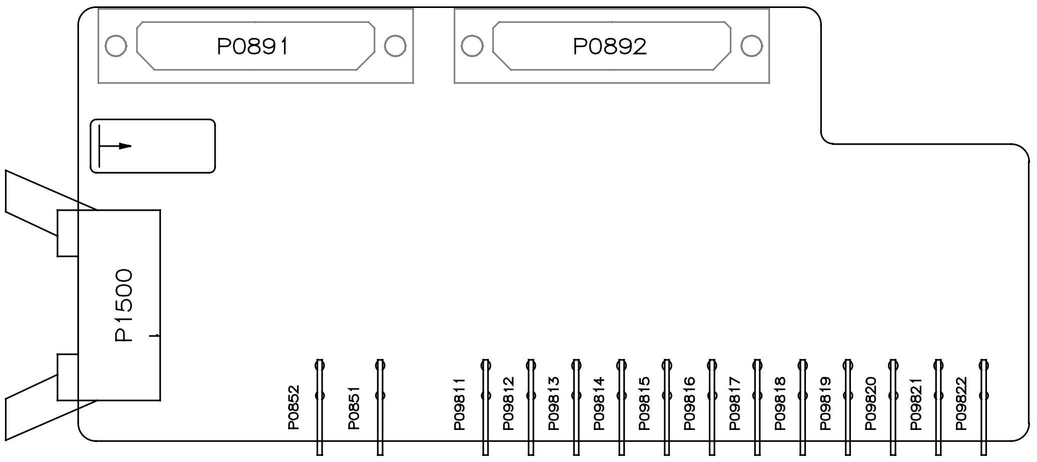


2.2 Entry Module Frame 147 317

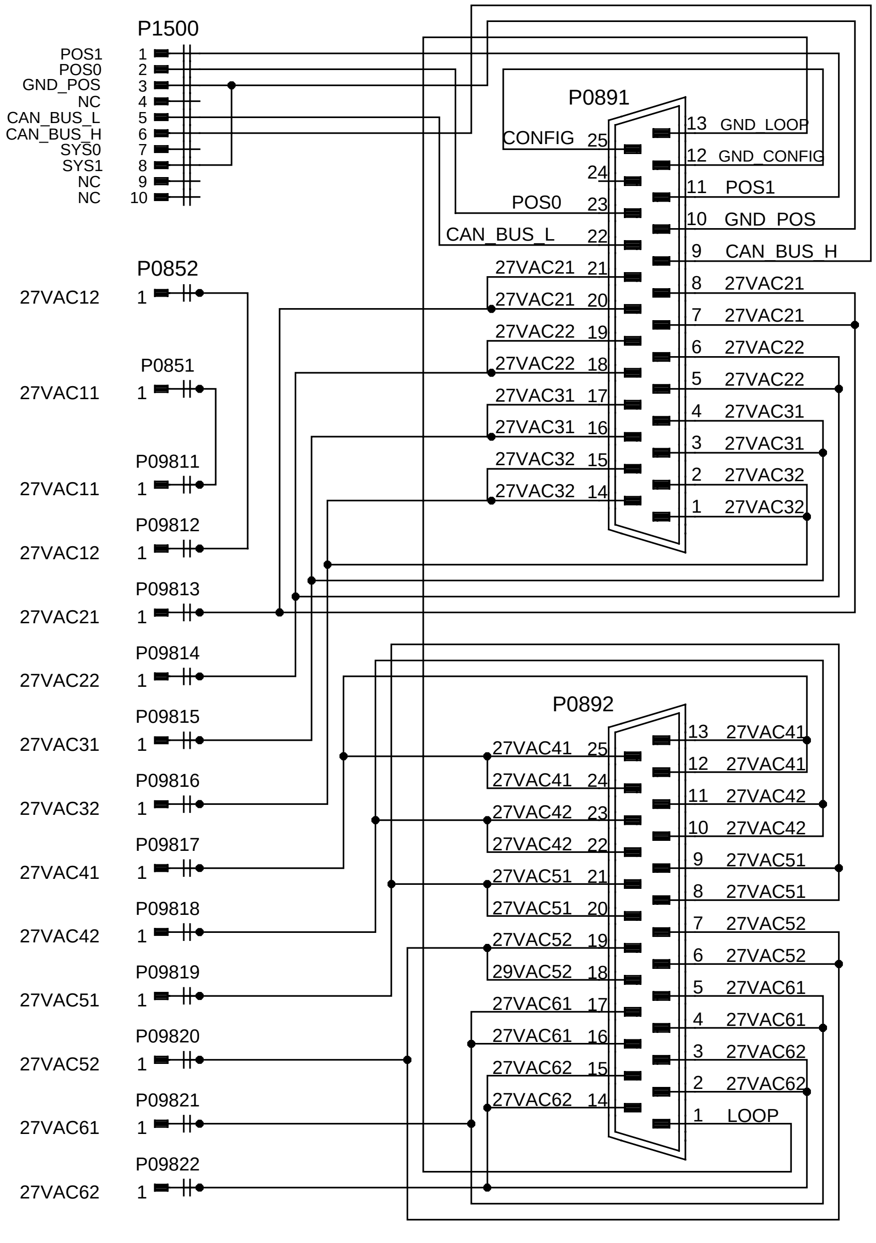
2.2.1 Functional Description

2.2.2 Connector boards

Connector Board E1 PCB Component Layout 146.154 revision 00

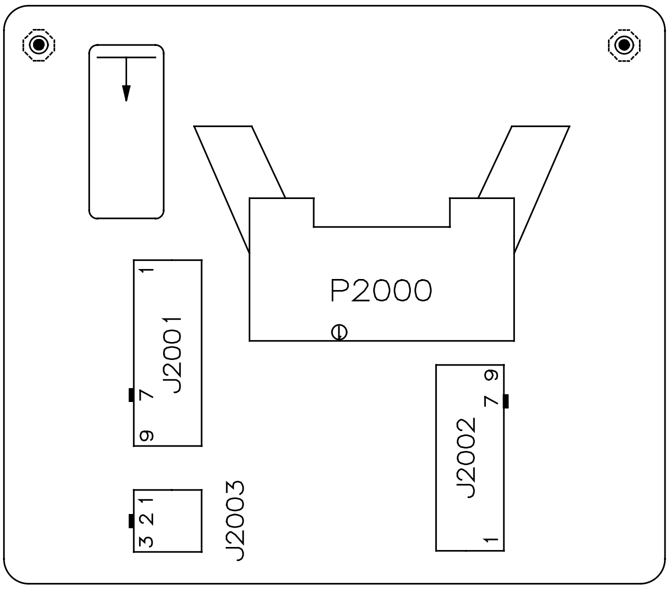

P0891
P0892
P1500
1
P0852
P0851
P09811
P09812
P09813
P09814
P09815
P09816
P09817
P09818
P09819
P09820
P09821
P09822

Connector Board E1 PCB Wiring Diagram Transformer Board 604.792 revision 00


P1500
POS1 1
POS0 2
GND_POS 3
NC 4
CAN_BUS_L 5
CAN_BUS_H 6
SYS0 7
SYS1 8
NC 9
NC 10
P0852
27VAC12 1
P0851
27VAC11 1
P09811
27VAC11 1
P09812
27VAC12 1
P09813
27VAC21 1
P09814
27VAC22 1
P09815
27VAC31 1
P09816
27VAC32 1
P09817
27VAC41 1
P09818
27VAC42 1
P09819
27VAC51 1
P09820
27VAC52 1
P09821
27VAC61 1
P09822
27VAC62 1
P0891
CONFIG 25
24
POS0 23
CAN_BUS_L 22
27VAC21 21
27VAC21 20
27VAC22 19
27VAC22 18
27VAC31 17
27VAC31 16
27VAC32 15
27VAC32 14
13 GND_LOOP
12 GND_CONFIG
11 POS1
10 GND_POS
9 CAN_BUS_H
8 27VAC21
7 27VAC21
6 27VAC22
5 27VAC22
4 27VAC31
3 27VAC31
2 27VAC32
1 27VAC32
P0892
27VAC41 25
27VAC41 24
27VAC42 23
27VAC42 22
27VAC51 21
27VAC51 20
27VAC52 19
29VAC52 18
27VAC61 17
27VAC61 16
27VAC62 15
27VAC62 14
13 27VAC41
12 27VAC41
11 27VAC42
10 27VAC42
9 27VAC51
8 27VAC51
7 27VAC52
6 27VAC52
5 27VAC61
4 27VAC61
3 27VAC62
2 27VAC62
1 LOOP

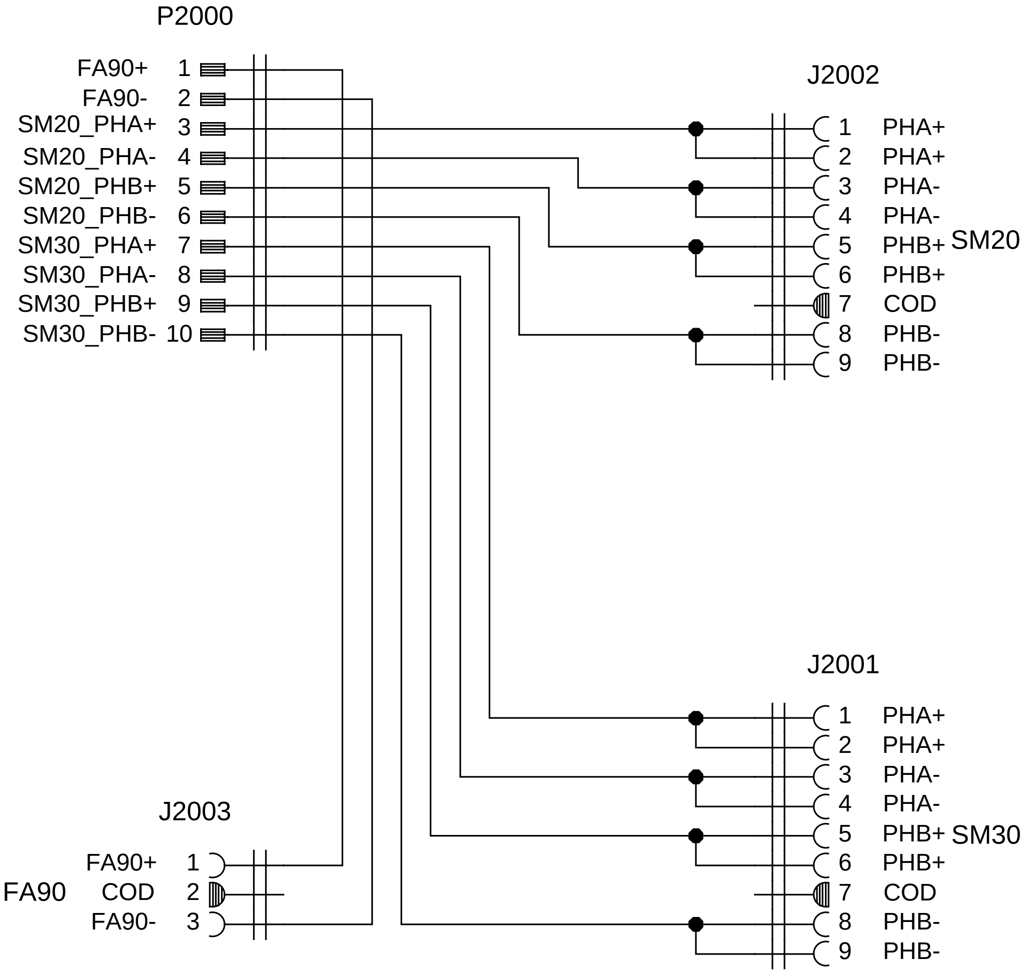
Connector Board E2 PCB

Component Layout 146.252 revision 00

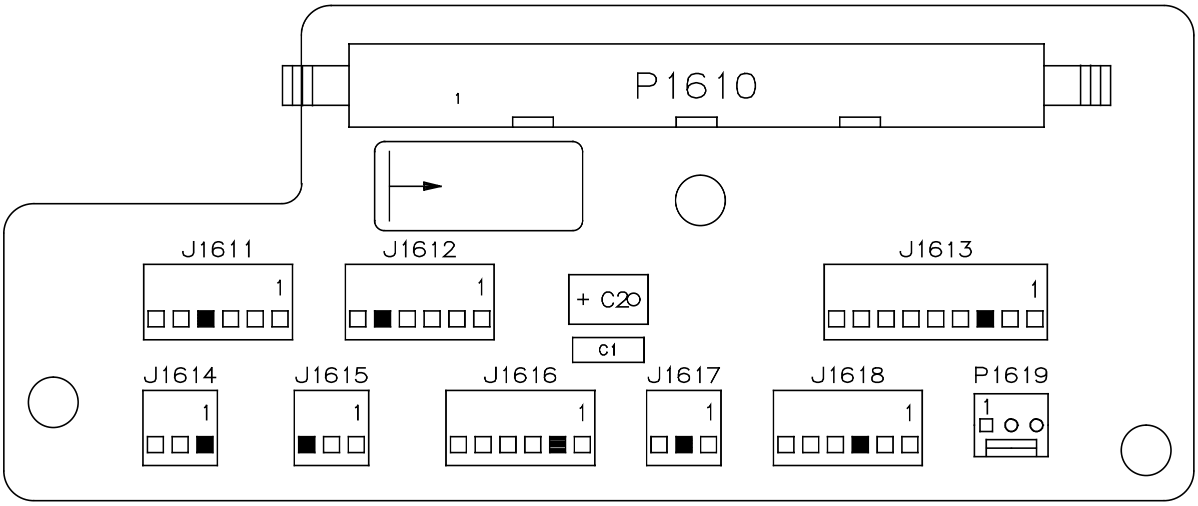

P2000
J2001
1
7
9
J2002
9
7
1
J2003
3 2 1

Connector Board E2 PCB

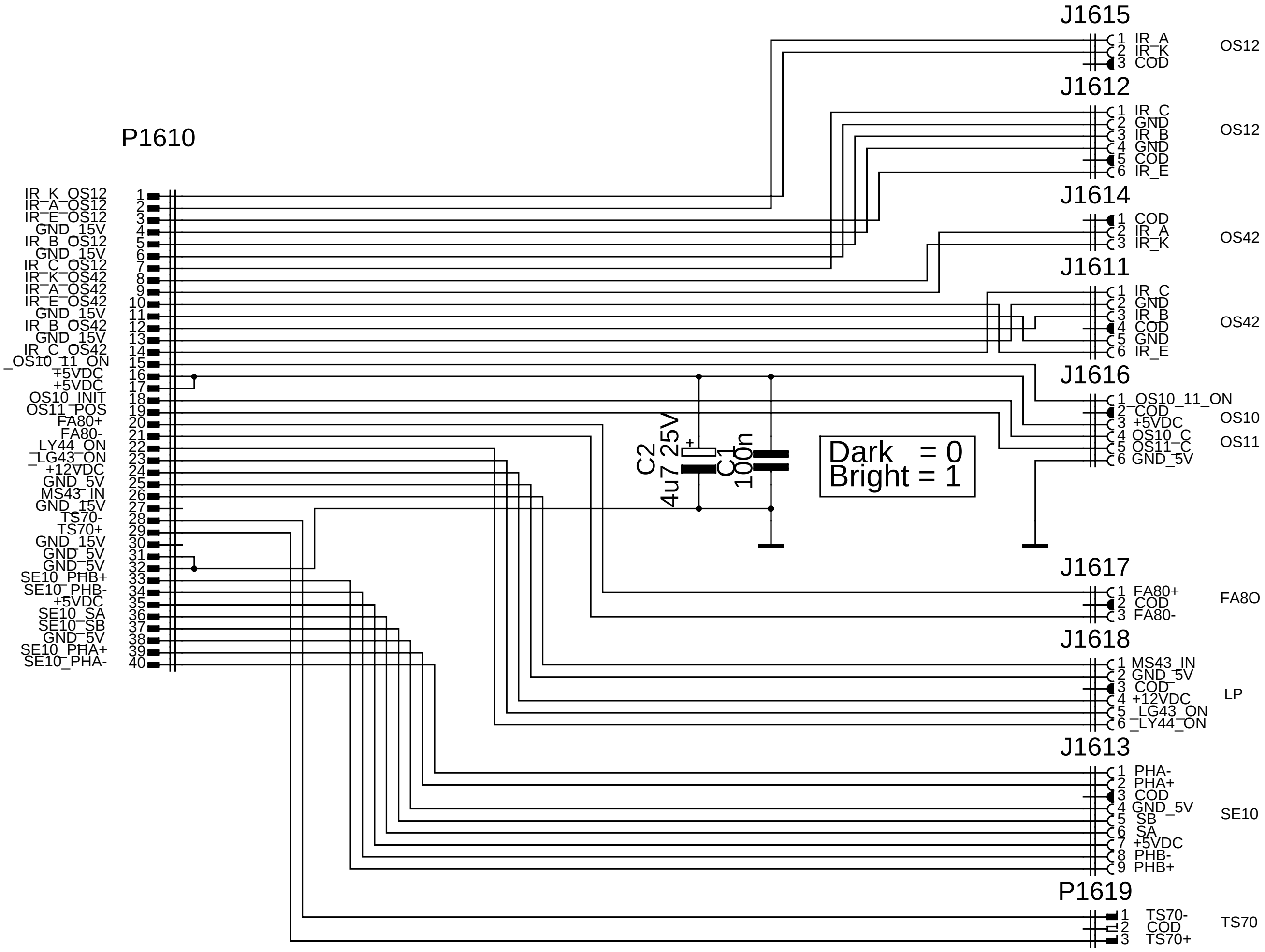
Incubator Lift Motors 604.829 revision 00


P2000
FA90+ 1
FA90- 2
SM20_PHA+ 3
SM20_PHA- 4
SM20_PHB+ 5
SM20_PHB- 6
SM30_PHA+ 7
SM30_PHA- 8
SM30_PHB+ 9
SM30_PHB- 10
J2002
1 PHA+
2 PHA+
3 PHA-
4 PHA-
5 PHB+
6 PHB+
7 COD
8 PHB-
9 PHB-
SM20
J2001
1 PHA+
2 PHA+
3 PHA-
4 PHA-
5 PHB+
6 PHB+
7 COD
8 PHB-
9 PHB-
SM30
J2003
FA90+ 1
COD 2
FA90- 3
FA90

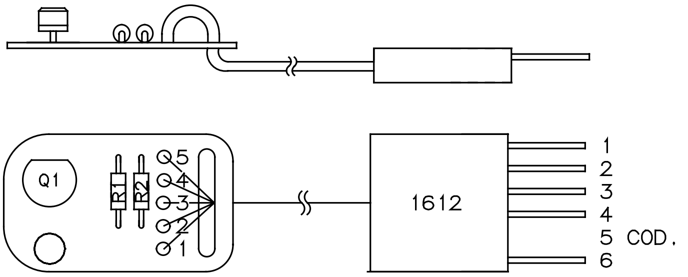
Connector Board E5 PCB Component Layout 146.248 revision 00


P1610
1
J1611
1
J1612
1
+ C2
C1
J1613
1
J1614
1
J1615
1
J1616
1
J1617
1
J1618
1
P1619
1

Connector Board E5 PCB Module Transport Board 604.827 revision 00

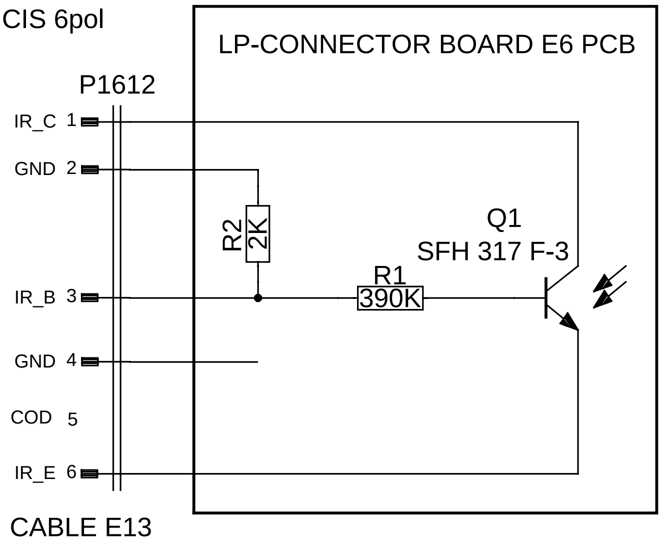

P1610
IR_K_OS12 1
IR_A_OS12 2
IR_E_OS12 3
GND_15V 4
IR_B_OS12 5
GND_15V 6
IR_C_OS12 7
IR_K_OS42 8
IR_A_OS42 9
IR_E_OS42 10
GND_15V 11
IR_B_OS42 12
GND_15V 13
IR_C_OS42 14
_OS10_11_ON 15
+5VDC 16
+5VDC 17
OS10_INIT 18
OS11_POS 19
FA80+ 20
FA80- 21
_LY44_ON 22
_LG43_ON 23
+12VDC 24
GND_5V 25
MS43_IN 26
GND_15V 27
TS70- 28
TS70+ 29
GND_15V 30
GND_5V 31
GND_5V 32
SE10_PHB+ 33
SE10_PHB- 34
+5VDC 35
SE10_SA 36
SE10_SB 37
GND_5V 38
SE10_PHA+ 39
SE10_PHA- 40
C2
4u7 25V
+
C1
100n
Dark = 0
Bright = 1
J1615
1 IR_A
2 IR_K
3 COD
OS12
J1612
1 IR_C
2 GND
3 IR_B
4 GND
5 COD
6 IR_E
OS12
J1614
1 COD
2 IR_A
3 IR_K
OS42
J1611
1 IR_C
2 GND
3 IR_B
4 COD
5 GND
6 IR_E
OS42
J1616
1 _OS10_11_ON
2 COD
3 +5VDC
4 OS10_C
5 OS11_C
6 GND_5V
OS10
OS11
J1617
1 FA80+
2 COD
3 FA80-
FA8O
J1618
1 MS43_IN
2 GND_5V
3 COD
4 +12VDC
5 _LG43_ON
6 _LY44_ON
LP
J1613
1 PHA-
2 PHA+
3 COD
4 GND_5V
5 SB
6 SA
7 +5VDC
8 PHB-
9 PHB+
SE10
P1619
1 TS70-
2 COD
3 TS70+
TS70

Connector Board E6 PCB Component Layout 146.311 revision 00

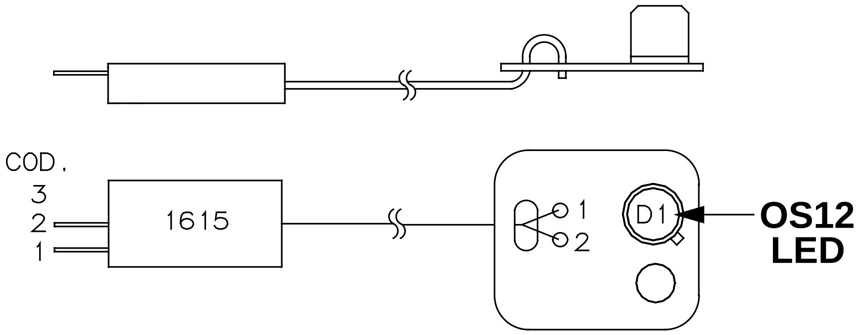

Q1
R1
R2
5
4
3
2
1
1612
1
2
3
4
5 COD.
6

Pin	Print
1	1
2	2
3	3
4	4
5	–
6	5

Connector Board E6 PCB Photo Transistor OS12 604.844 revision 00

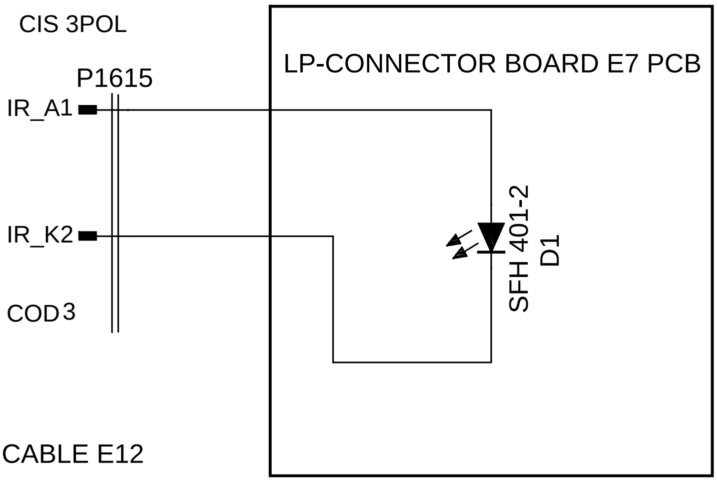

CIS 6pol
LP-CONNECTOR BOARD E6 PCB
P1612
IR_C 1
GND 2
R2
2K
Q1
SFH 317 F-3
R1
390K
IR_B 3
GND 4
COD 5
IR_E 6
CABLE E13

Connector Board E7 PCB Component Layout 146.312 revision 00


COD.
3
2
1
1615
1
2
D1
OS12
LED

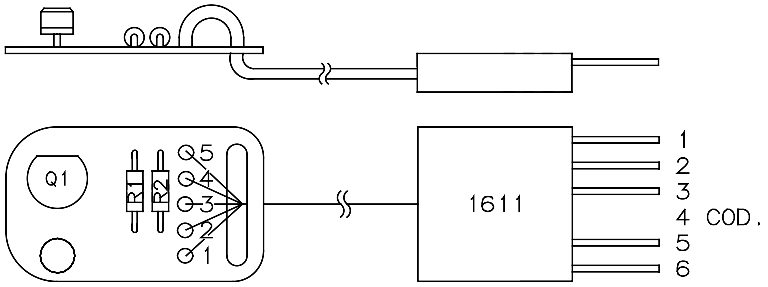
Pin	Print
1	1
2	2
3	–

Connector Board E7 PCB LED OS12 604.845 revision 00


CIS 3POL
LP-CONNECTOR BOARD E7 PCB
P1615
IR_A1
IR_K2
COD3
SFH 401-2
D1
CABLE E12

Connector Board E9 PCB

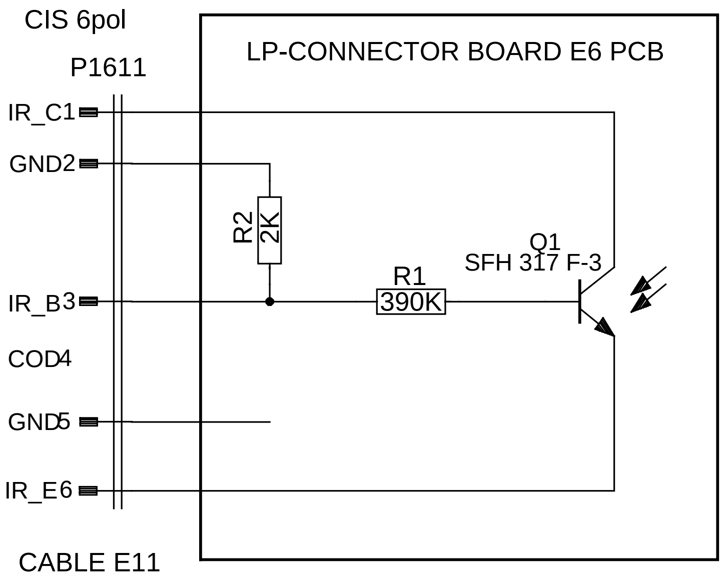
Component Layout 146.313 revision 00


Q1
R1
R2
5
4
3
2
1
1611
1
2
3
4 COD.
5
6

Pin	Print
1	1
2	2
3	3
4	–
5	4
6	5

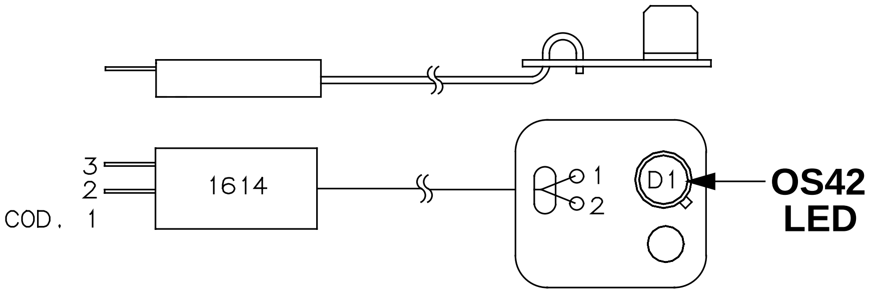
Connector Board E9 PCB

Photo Transistor 604.846 revision 00


CIS 6pol
P1611
LP-CONNECTOR BOARD E6 PCB
IR_C1
GND2
R2
2K
Q1
SFH 317 F-3
R1
390K
IR_B3
COD4
GND5
IR_E6
CABLE E11

Connector Board E10 PCB

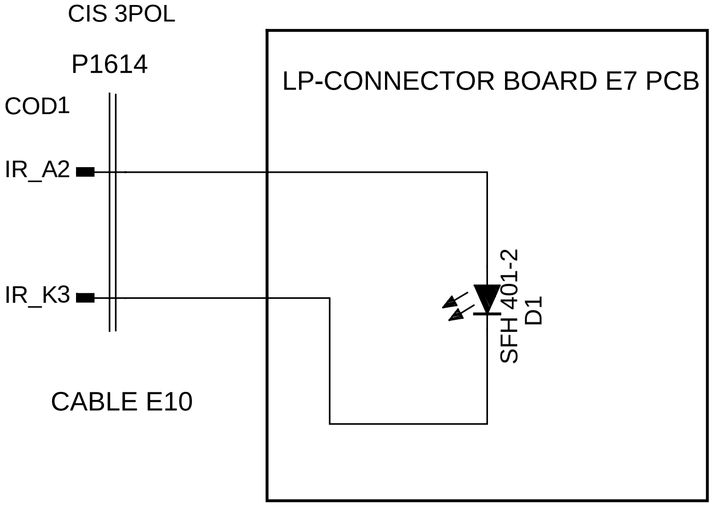
Component Layout 146.314 revision 00


3
2
COD. 1
1614
1
2
D1
OS42
LED

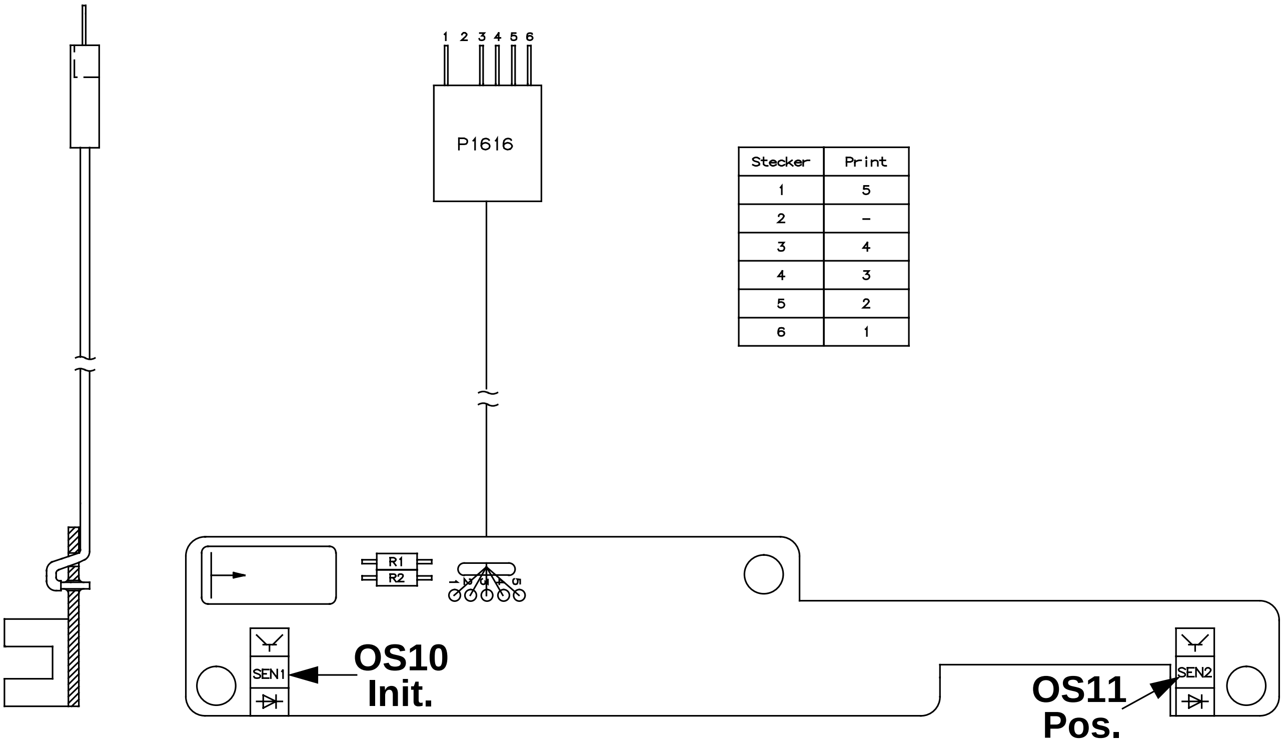
Pin	Print
1	–
2	2
3	3

Connector Board E10 PCB

LED OS42 604.847 revision 00

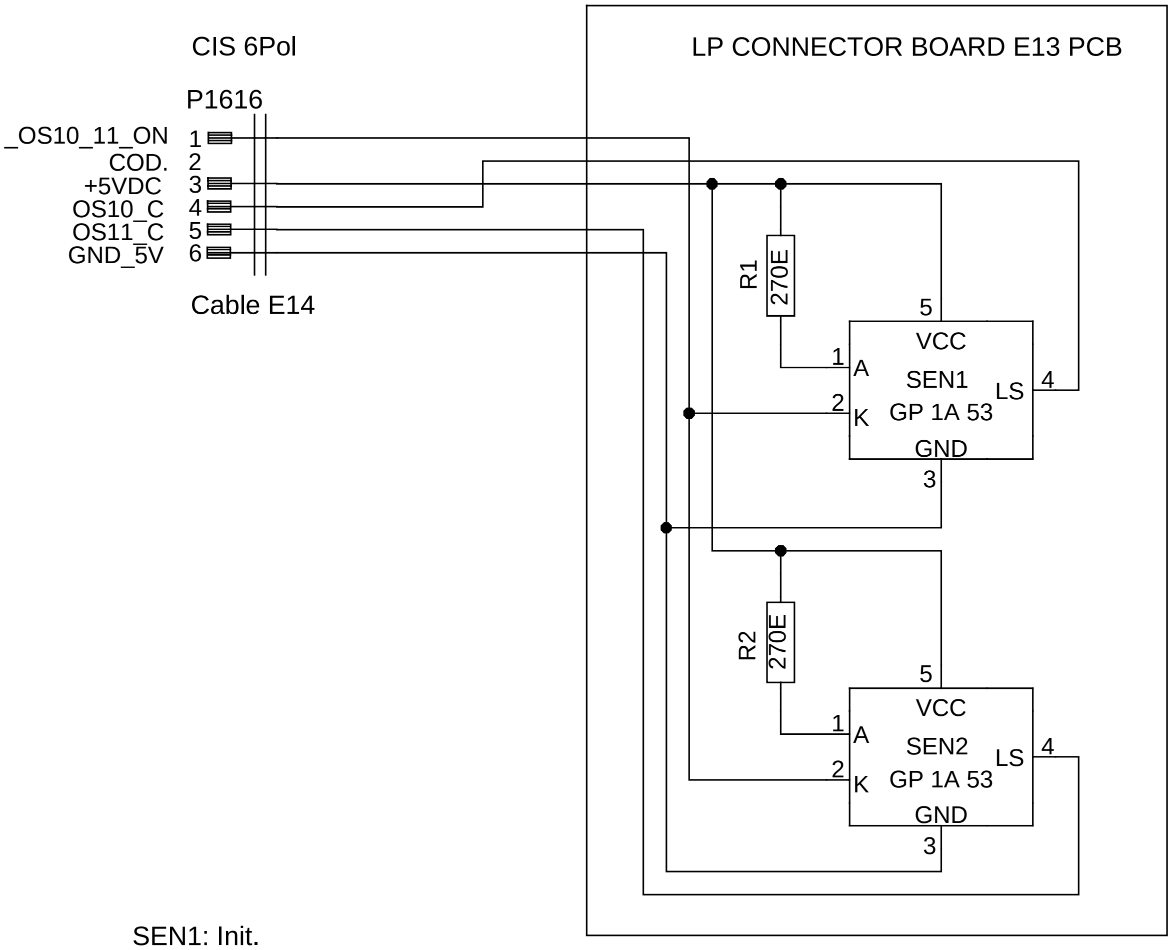

CIS 3POL
P1614
COD1
LP-CONNECTOR BOARD E7 PCB
IR_A2
IR_K3
SFH 401-2
D1
CABLE E10

Connector Board E13 PCB Component Layout 146.390 revision 01


1 2 3 4 5 6
P1616
R1
R2
SEN1
OS10
Init.
SEN2
OS11
Pos.

Stecker	Print
1	5
2	-
3	4
4	3
5	2
6	1

Connector Board E13 PCB OS 10 / 11 604.851 revision 00

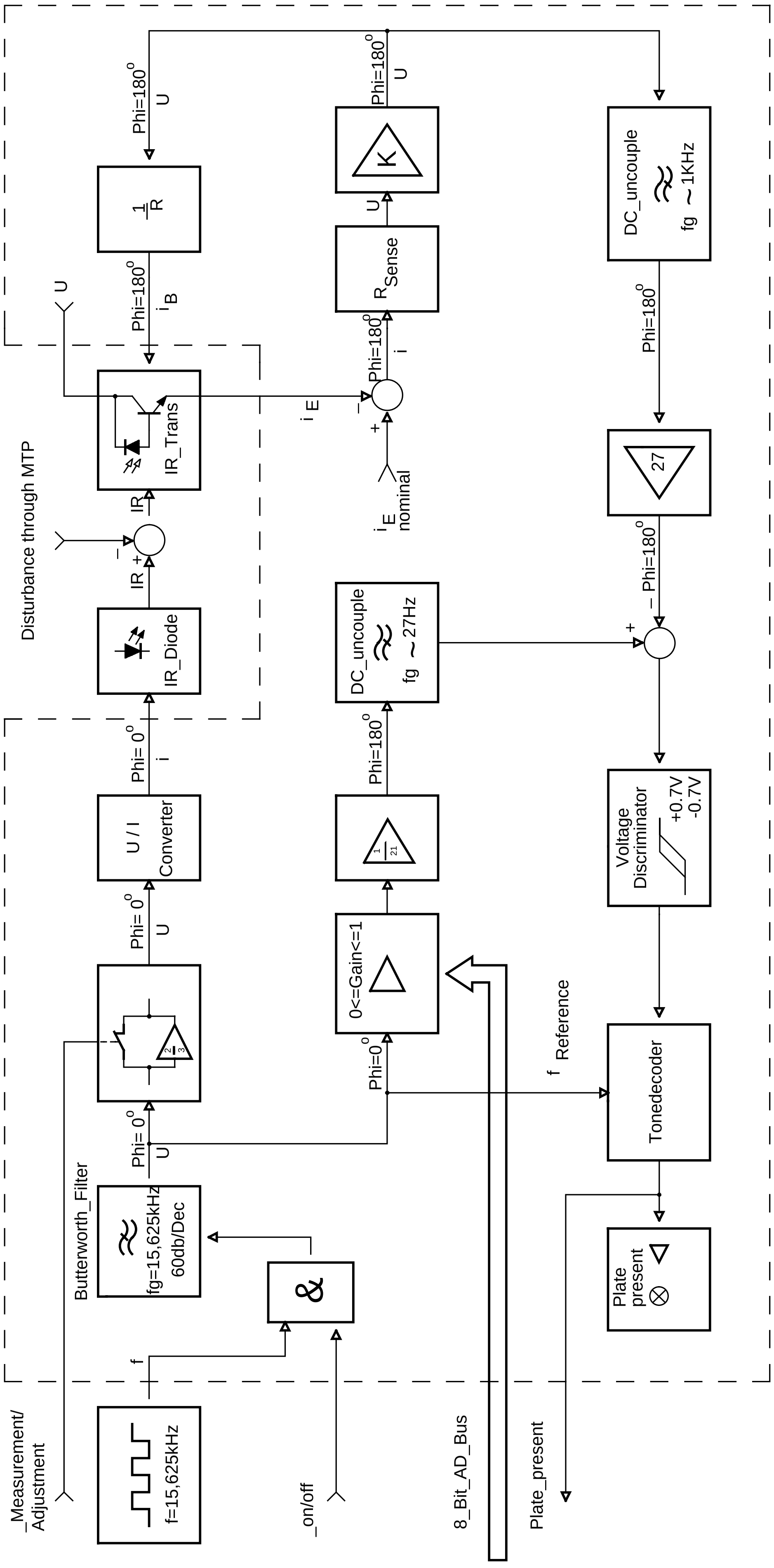

CIS 6Pol
P1616
_OS10_11_ON 1
COD. 2
+5VDC 3
OS10_C 4
OS11_C 5
GND_5V 6
Cable E14
LP CONNECTOR BOARD E13 PCB
R1
270E
5
VCC
1
A
SEN1
2
K
GP 1A 53
LS
4
GND
3
R2
270E
5
VCC
1
A
SEN2
2
K
GP 1A 53
LS
4
GND
3

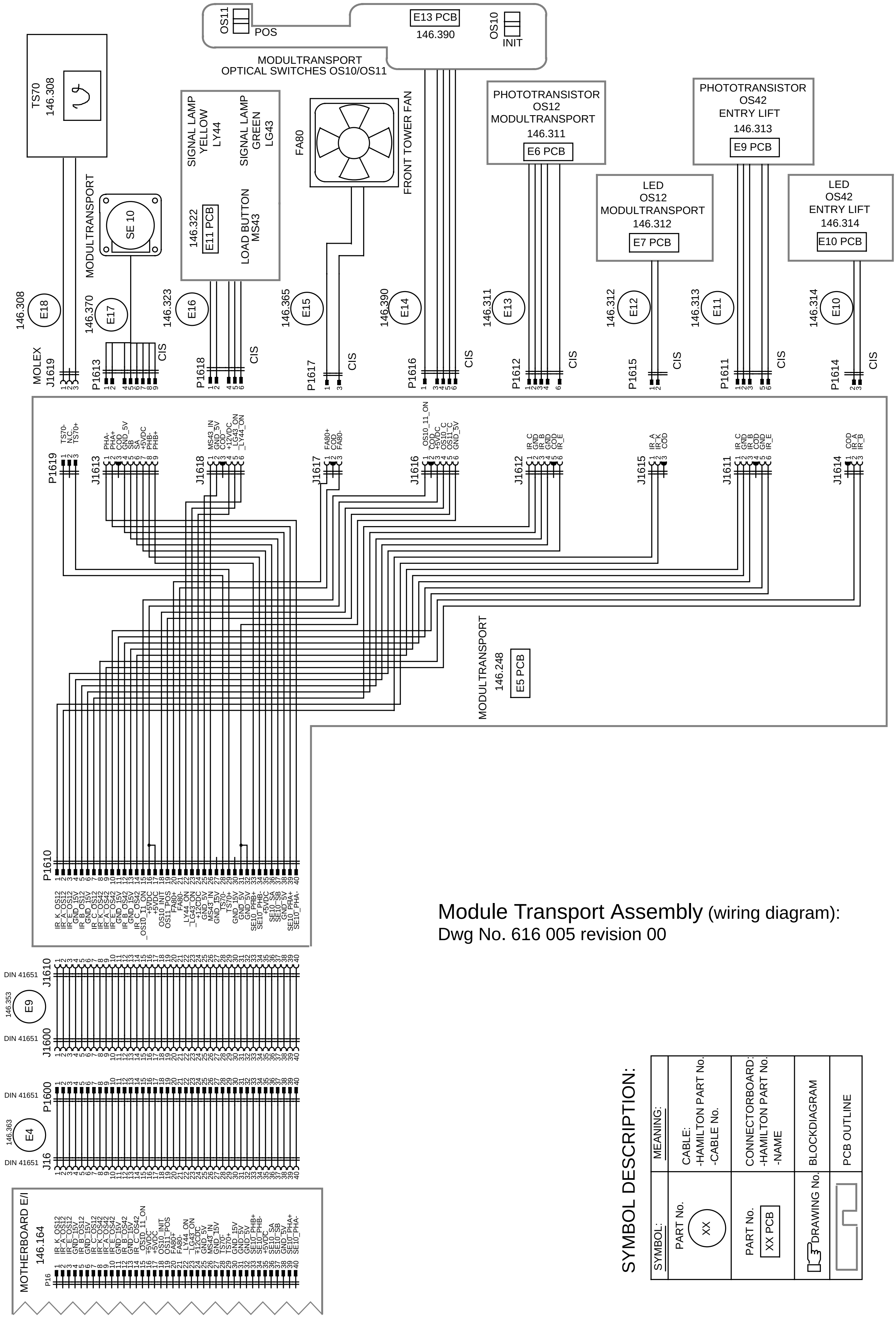
SEN1: Init.

SEN2: Position

2.2.3 **MTP (Micro Titer Plate)-Sensor** (block diagram) 614 143 revision 00

2.2.4 **Module Transport Assembly** (wiring diagram) 616 005 (see next page)


_Measurement/
Adjustment
f=15,625kHz
f
_on/off
&
Butterworth_Filter
fg=15,625kHz
60db/Dec
Phi= 0°
U
2/3
Phi= 0°
U
U / I
Converter
Phi= 0°
i
IR_Diode
IR +
–
Disturbance through MTP
IR
IR_Trans
U
Phi=180°
i_B
1/R
Phi=180°
U
8_Bit_AD_Bus
Phi=0°
0<=Gain<=1
1/21
Phi=180°
DC_uncouple
fg ~ 27Hz
i_E
nominal
+
–
i E
Phi=180°
i
R_Sense
U
K
Phi=180°
U
Plate_present
f Reference
Plate
present
Tonedecoder
Voltage
Discriminator
+0.7V
-0.7V
+
– Phi=180°
27
Phi=180°
DC_uncouple
fg ~1KHz


OS11
POS
E13 PCB
146.390
OS10
INIT
MODULTRANSPORT
OPTICAL SWITCHES OS10/OS11
TS70
146.308
MODULTRANSPORT
SE 10
SIGNAL LAMP
YELLOW
LY44
SIGNAL LAMP
GREEN
LG43
146.322
E11 PCB
LOAD BUTTON
MS43
FA80
FRONT TOWER FAN
PHOTOTRANSISTOR
OS12
MODULTRANSPORT
146.311
E6 PCB
PHOTOTRANSISTOR
OS42
ENTRY LIFT
146.313
E9 PCB
LED
OS12
MODULTRANSPORT
146.312
E7 PCB
LED
OS42
ENTRY LIFT
146.314
E10 PCB
146.308 E18
146.370 E17
146.323 E16
146.365 E15
146.390 E14
146.311 E13
146.312 E12
146.313 E11
146.314 E10
MOLEX
J1619
P1613
P1618
P1617
P1616
P1612
P1615
P1611
P1614
CIS
P1619: 1 TS70-, 2 N.C., 3 TS70+
J1613: 1 PHA-, 2 PHA+, 3 COD, 4 GND_5V, 5 SB, 6 SA, 7 +5VDC, 8 PHB-, 9 PHB+
J1618: 1 MS43_IN, 2 GND_5V, 3 COD, 4 +12VDC, 5 _LG43_ON, 6 _LY44_ON
J1617: 1 FA80+, 2 COD, 3 FA80-
J1616: 1 _OS10_11_ON, 2 COD, 3 +5VDC, 4 OS10_C, 5 OS11_C, 6 GND_5V
J1612: 1 IR_C, 2 GND, 3 IR_B, 4 GND, 5 COD, 6 IR_E
J1615: 1 IR_A, 2 IR_K, 3 COD
J1611: 1 IR_C, 2 GND, 3 IR_B, 4 COD, 5 GND, 6 IR_E
J1614: 1 COD, 2 IR_A, 3 IR_B
MODULTRANSPORT
146.248
E5 PCB
P1610
1 IR_K_OS12
2 IR_A_OS12
3 IR_E_OS12
4 GND_15V
5 IR_B_OS12
6 GND_15V
7 IR_C_OS12
8 IR_K_OS42
9 IR_A_OS42
10 IR_E_OS42
11 GND_15V
12 IR_B_OS42
13 GND_15V
14 IR_C_OS42
15 _OS10_11_ON
16 +5VDC
17 +5VDC
18 OS10_INIT
19 OS11_POS
20 FA80+
21 FA80-
22 _LY44_ON
23 _LG43_ON
24 +12CDC
25 GND_5V
26 MS43_IN
27 GND_15V
28 TS70-
29 TS70+
30 GND_15V
31 GND_5V
32 GND_5V
33 SE10_PHB+
34 SE10_PHB-
35 +5VDC
36 SE10_SA
37 SE10_SB
38 GND_5V
39 SE10_PHA+
40 SE10_PHA-
DIN 41651
J1610
146.353
E9
DIN 41651
J1600
DIN 41651
P1600
146.363
E4
DIN 41651
J16
MOTHERBOARD E/I
146.164
P16

Module Transport Assembly (wiring diagram):

Dwg No. 616 005 revision 00

SYMBOL DESCRIPTION:

SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
DRAWING No.	BLOCKDIAGRAM
	PCB OUTLINE

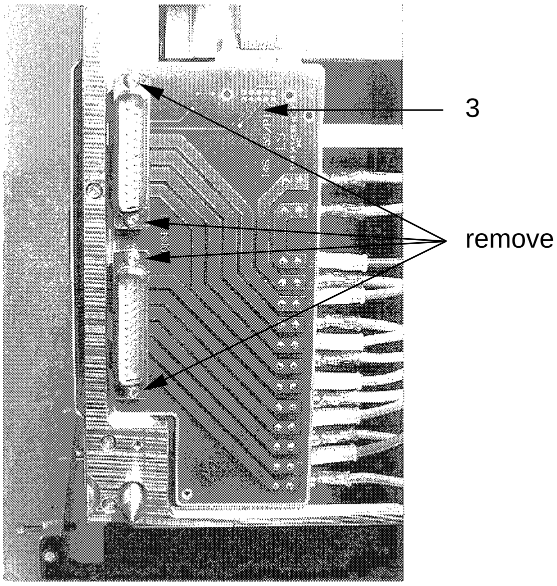
2.2.5 Replacing spare parts

NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

2.2.5.1 Connector board E1 item 3

Remove *rear cover plate item 89*.

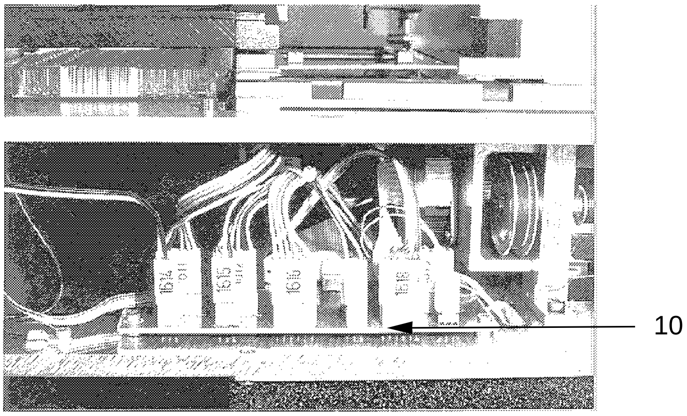
Disconnect all cables, remove 4 screws, and replace *connector board E1 item 3*.



2.2.5.2 Connector board E5 item 10

Disconnect all cables.

Unscrew *connector board E5 item 10* (3 screws) and replace.

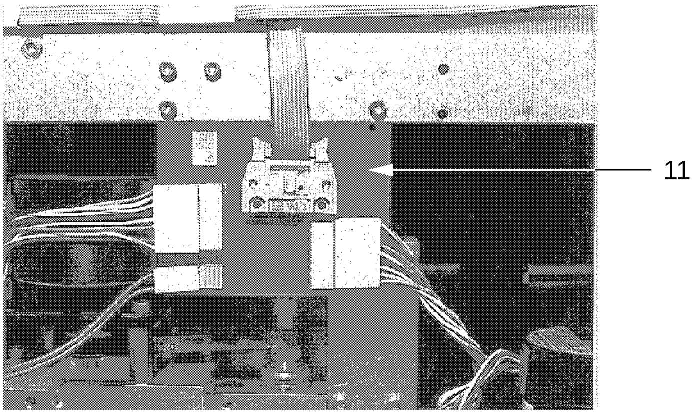


2.2.5.3 Connector board E2 item 11

First remove hood (see section 2.1.6).

Disconnect the 4 cables.

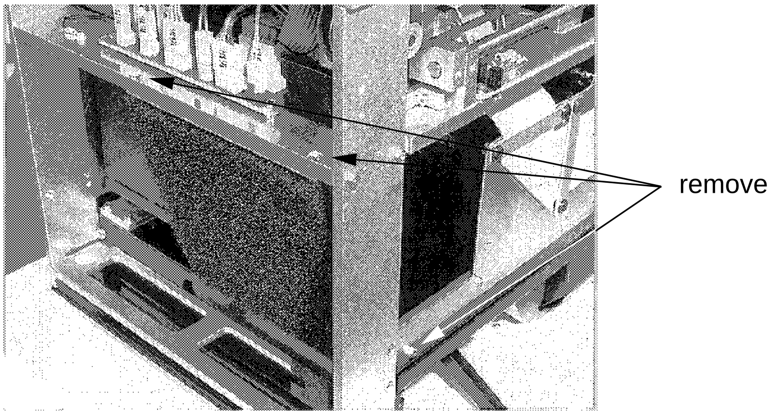
Remove and replace *connector board E2 item 11*.



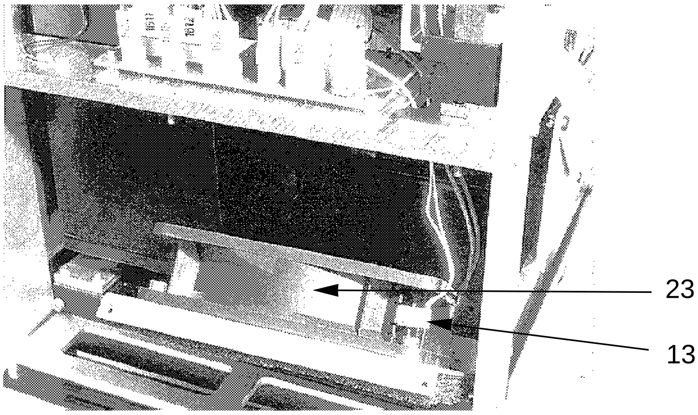
2.2.5.4 Temperature sensor item 13, tower fan (front) item 23

Remove side cover left (see section 2.1.6).

Unscrew *fan support item 72* (3 screws).



Unscrew and replace *temperature sensor item 13* and / or *tower fan (front) item 23*.

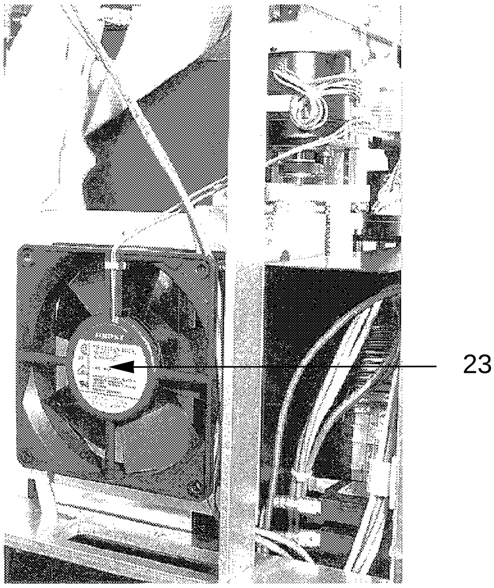


2.2.5.5 Tower fan (rear) item 23

Remove hood (see section 2.1.6).

Disconnect cable from connector board E2.

Unscrew (4 screws) and replace *tower fan (rear) item 23*.

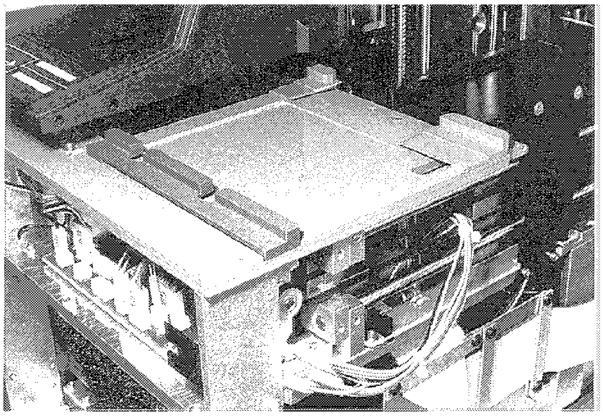


2.2.5.6 Connector boards E6 item 14 and E7 item 15

Loosen the fixing screw of the front right hood.

Remove side cover right (see section 2.1.6).

Disconnect and free the three cables from connector board 5, then cut the tie wraps.



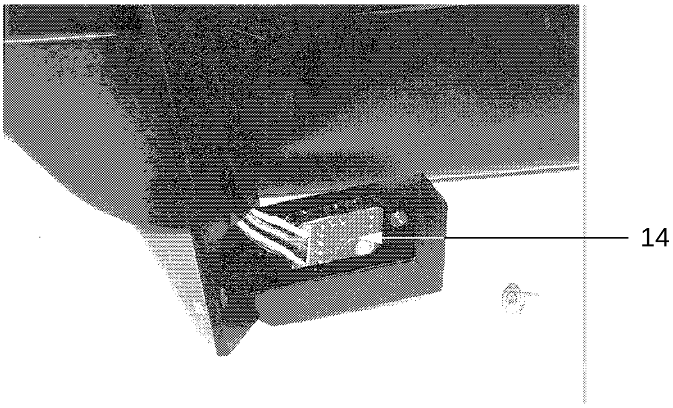
Connector board E6:

Unscrew *sensor support plate item 62*.

Unscrew *sensor holder right item 63*.

Unscrew and replace *connector board E6 item 14*.

When remounting, use a new *adhesive film item 91* and also fit new tie wraps.



Connector board E7:

Unscrew the *sensor cover left item 97* at the rear of the *sensor holder left item 61*.

Unscrew and replace c*onnector board E7 item 15*.

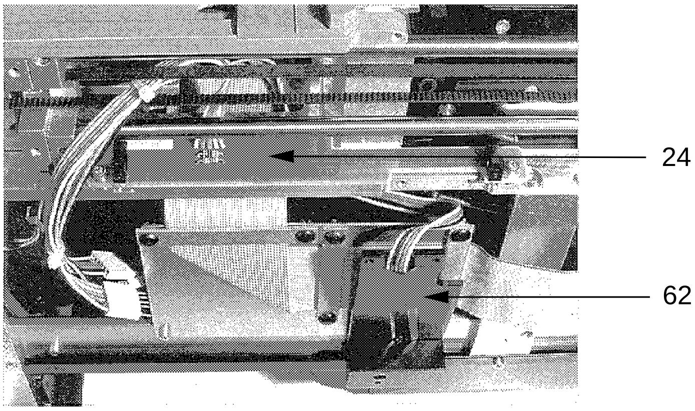
2.2.5.7 Connector board E13 item 24

Remove hood and side cover right (see section 2.1.6).

Disconnect and free the three cables from connector board 5, then cut the tie wraps.

Unscrew *sensor support plate item 62*.

Unscrew (3 screws) and remove *connector board E13 item 24*.



2.2.5.8 Step motor item 18, and gear belt item 126

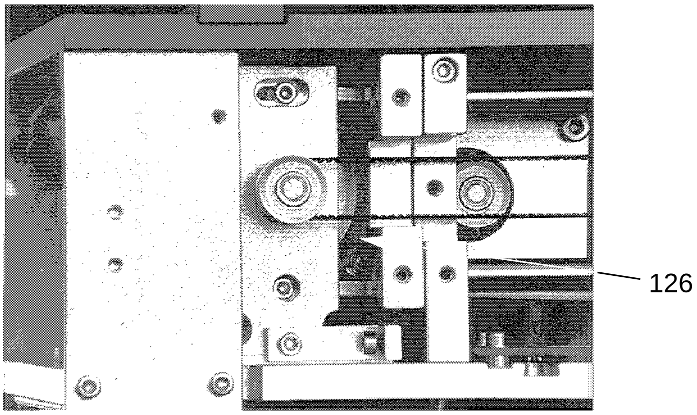
Remove side cover right (see section 2.1.6).

Disconnect plug from connector board 5.

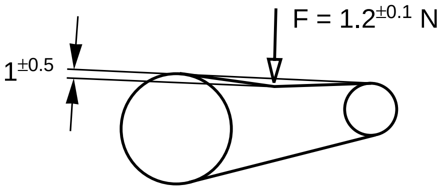
Unscrew (2 screws) the *step motor item 18* and replace.

Gear belt item 126:

Remove the two belt tightening screws and remove / replace *gear belt item 126*.



Belt tension:



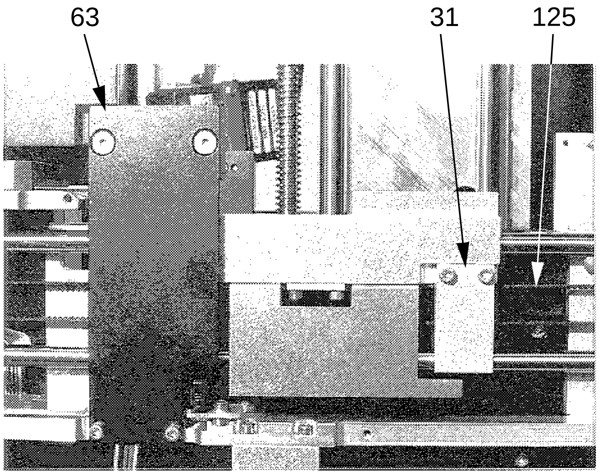
2.2.5.9 Gear belt item 125

Remove hood and side cover right (see section 2.1.6).

Unscrew and remove *module transport fork compl. p/n 148 228*.

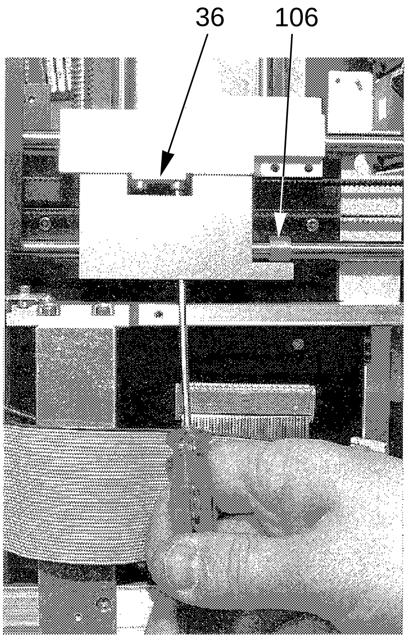
Unscrew the cable support plate (item 94 of the entry module raw, see section 2.1.7.2).

Move module transport fork support back past *sensor holder right item 63*.

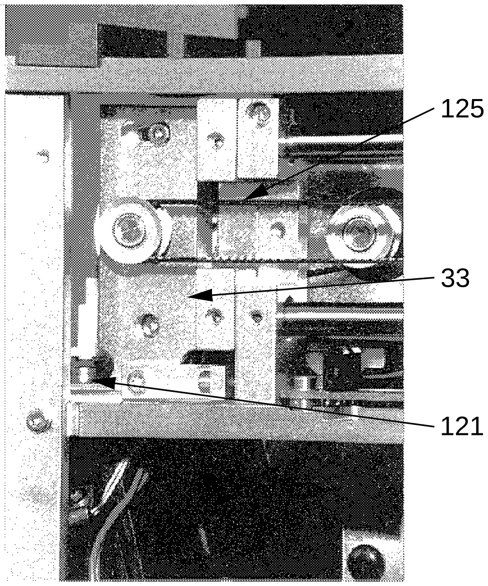


Unscrew and remove *guide plate item 31*.

Now unscrew *belt clamp item 36*.



Loosen screw item 121 fixing *bearing support 2 item 33*.

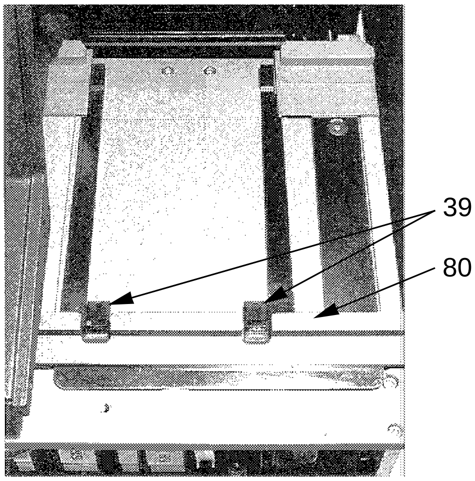


Replace *gear belt item 125*.

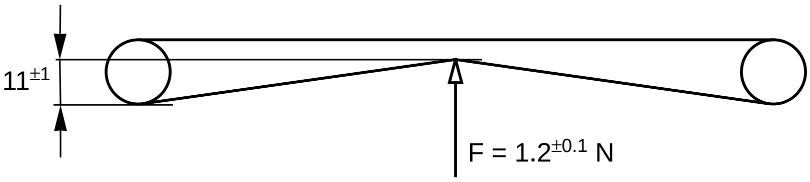
Remounting:

Remember to slide the *bush item 106* under *guide plate item 31* before remounting the latter.

Center the two *rests front item 39* in the slots in *guide bar 1 item 80*.



Belt tension:



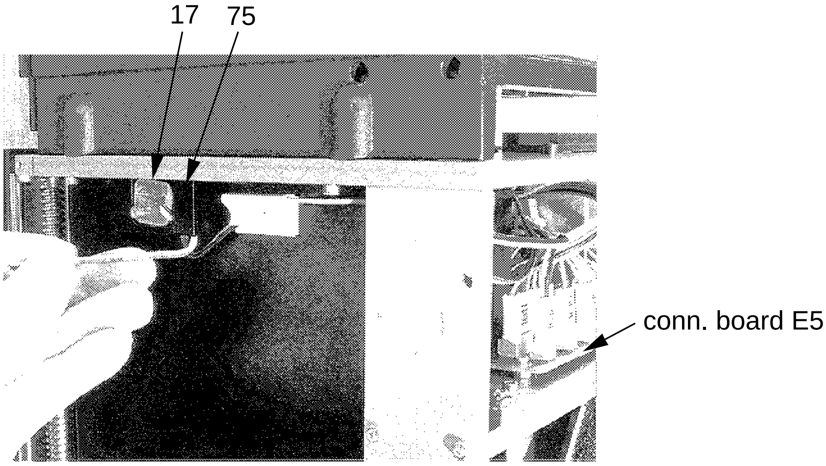
2.2.5.10 Connector board E10 item 17

Remove side cover left (see section 2.1.6).

Disconnect connector board E10 cable on connector board E5.

Unscrew *sensor holder front left item 75* (2 screws from underneath).

Remove and replace *connector board E10*.



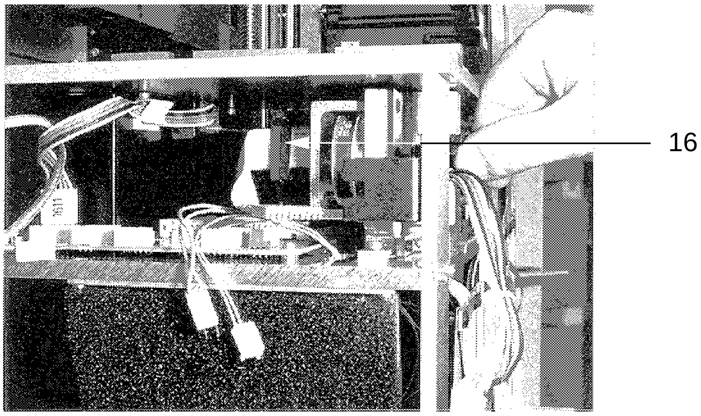
2.2.5.11 Connector board E9 item 16

Remove side cover left (see section 2.1.6).

Position the *module transport fork* above the front tower.

Unplug most small connectors on conn. board E5 for better access.

From the side, unscrew connector board E9 (item 16) and replace.



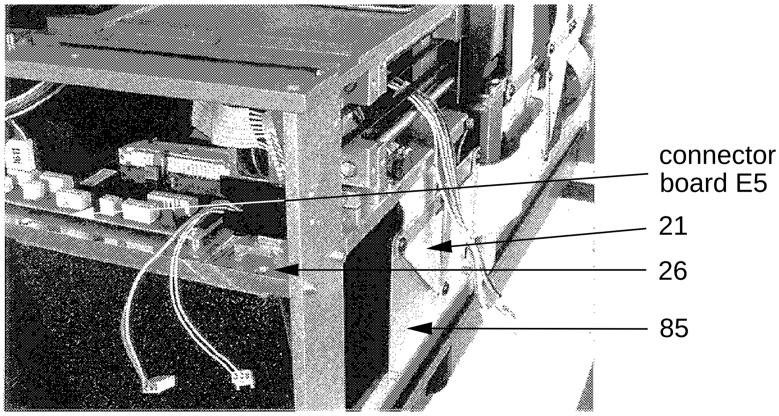
2.2.5.12 Cable E9 item 21

Remove the side cover left (see section 2.1.6).

Unplug most small connectors on conn. board E5 for better access.

Unplug cable E9 from connector board E5, remove through the slot on the right side of the base plate item 26.

Unscrew *cable support plate 2 item 85* and free cable, replace.



2.2.6 Spare Parts List

ENTRY MODULE FRAME 147317 Revision: 00

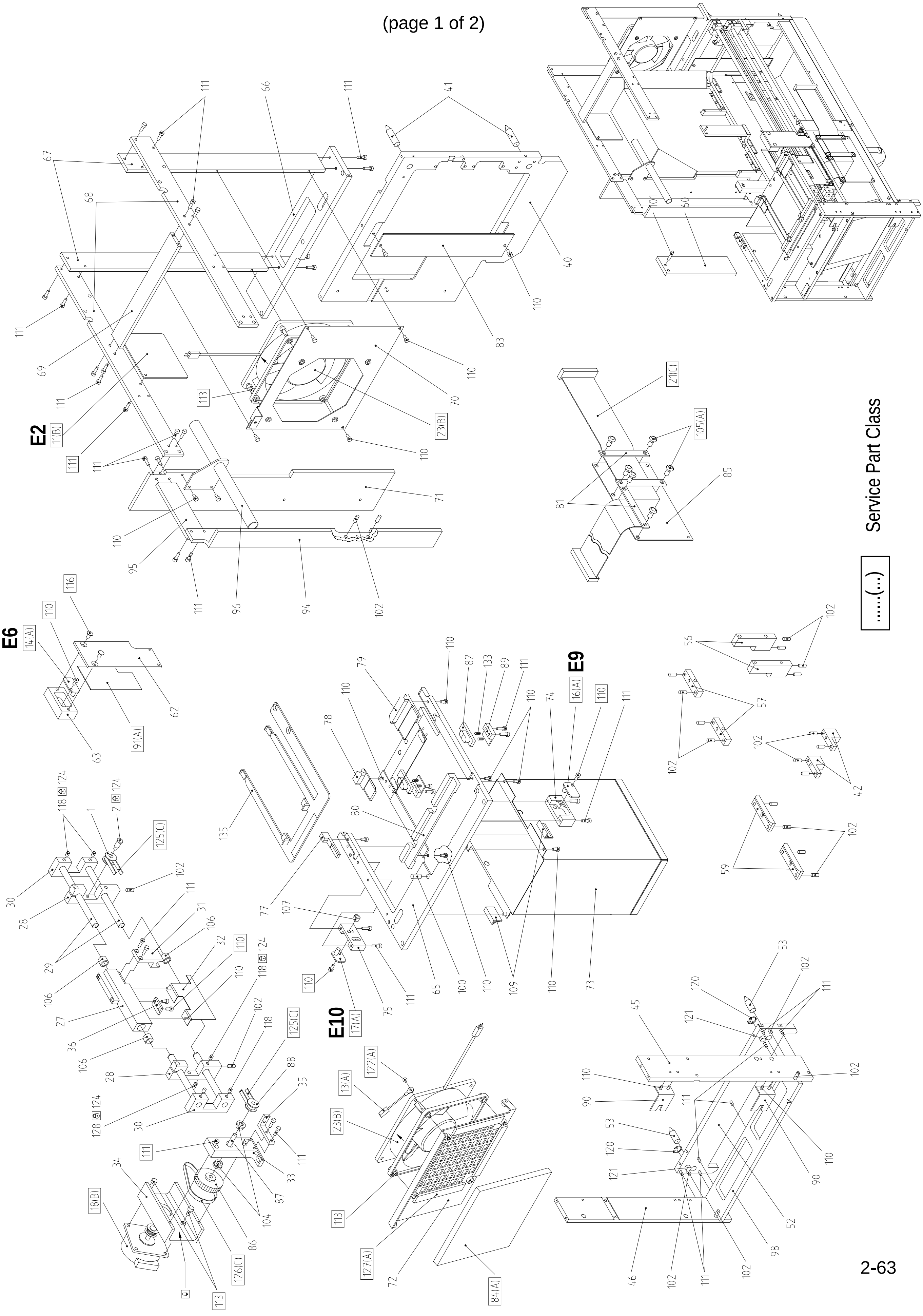
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
148262	ROLLE 1	01	1	1.000	
137609	ACHSSCHRAUBE	00	2	1.000	
146154	CONNECTORBOARD E1 PCB	00	3	1.000	A
146248	CONNECTORBOARD E5 PCB	00	10	1.000	B
146252	CONNECTORBOARD E2 PCB	00	11	1.000	B
146308	TEMPERATURE SENSOR TS70	00	13	1.000	A
146311	CONNECTORBOARD E6 PCB	00	14	1.000	A
146312	CONNECTORBOARD E7 PCB	00	15	1.000	A
146313	CONNECTORBOARD E9 PCB	00	16	1.000	A
146314	CONNECTORBOARD E10 PCB	00	17	1.000	A
146370	STEP MOTOR E SE10	01	18	1.000	B
146353	CABLE E9	00	21	1.000	C
146365	TOWER FAN FA80	00	23	2.000	B
146390	CONNECTORBOARD E13 PCB	00	24	1.000	A
147318	GRUNDPLATTE	00	26	1.000	
147319	SCHLITTEN	00	27	1.000	
147320	LAGERBOCK 1	00	28	2.000	
147321	LINEARFUEHRUNGSWELLE	01	29	2.000	
147322	DISTANZHALTER	00	30	2.000	
147323	FUEHRUNGSSTUECK	00	31	1.000	
147324	LS-FAHNE	00	32	1.000	
147325	LAGERBOCK 2	00	33	1.000	
147327	MOTORENBEFESTIGUNG	01	34	1.000	
147330	SPANNVORRICHTUNG	00	35	1.000	
147331	ZAHNRIEMENKLEMME	00	36	1.000	
147335	RUECKWAND	00	40	1.000	
147336	POSITIONIERSTIFT HINTEN	00	41	2.000	
147337	BEFESTIGUNGSWINKEL	00	42	2.000	
147338	MITTELSTUETZE RECHTS	00	43	1.000	
147339	MITTELSTUETZE LINKS	00	44	1.000	
147340	TRAEGER RECHTS	00	45	1.000	
147341	TRAEGER LINKS	00	46	1.000	
147342	TORSIONSPLATTE LINKS	00	47	1.000	
147343	TORSIONSPLATTE RECHTS	00	48	1.000	
147344	BODEN ENTRY	00	49	1.000	
147345	KUFE	00	50	2.000	
147346	ANSCHLAG HINTEN	00	51	3.000	
147347	MODULTRAEGER 1	00	52	1.000	
147348	POSITIONIERSTIFT VORNE	00	53	2.000	
147349	LAENGSTRAEGER	00	54	1.000	
147350	MITTELPLATTE	00	55	1.000	
147351	BEFESTIGUNGSPLATTE OBEN	00	56	2.000	
147352	BEFESTIGUNGSPLATTE UNTEN	00	57	2.000	
147353	TUERANSCHLAG	00	58	2.000	
147354	TOWERZENTRIERUNG	00	59	2.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147355	HAUBENANSCHLAG	00	60	1.000	
147356	SENSORHALTER LINKS	00	61	1.000	
147357	SENSORHALTEPLATTE	00	62	1.000	
147358	SENSORHALTER RECHTS	00	63	1.000	
147359	DISTANZPLATTE	00	64	1.000	
147360	BASISPLATTE VORNE	01	65	1.000	
147361	BASISPLATTE HINTEN	00	66	1.000	
147362	RACKSTUETZE HINTEN	00	67	2.000	
147364	RACKLAENGSTRAEGER	00	68	2.000	
147365	RACKAUFLAGE	00	69	1.000	
147366	LUEFTERBEFESTIGUNG	00	70	1.000	
147367	RACKSTUETZE VORNE	00	71	1.000	
147543	LUEFTERBLECH	00	72	1.000	
147371	STACKSCHACHT	00	73	1.000	
147372	SENSORHALTER VORNE RECHTS	00	74	1.000	
147373	SENSORHALTER VORNE LINKS	00	75	1.000	
147457	GLEITBAHN 1	00	77	1.000	
147458	GLEITBAHN 2	00	78	1.000	
147459	GLEITBAHN 3	00	79	1.000	
147460	FUEHRUNGSLEISTE 1	00	80	1.000	
147638	KABELKLEMME	00	81	3.000	A
148363	NOCKEN	00	82	2.000	
147641	SCHUTZBLECH	00	83	1.000	
147683	FILTERMATTE	00	84	1.000	A
147684	KABELFHRUNG 2	00	85	1.000	
147686	ZAHNRIEMENRAD Z=58	00	86	1.000	
147735	LAGERWELLE	00	87	1.000	
147374	ZAHNRIEMENRAD Z = 18	00	88	1.000	
148364	NOCKENHALTER	00	89	2.000	
147764	WINKEL MIT SCHLITZ	00	90	2.000	
147777	ABDECKFOLIE	00	91	1.000	A
147806	ABDECKBLECH 1	00	92	1.000	
147807	ABDECKBLECH 2	01	93	1.000	
147910	STACKTRGER	00	94	1.000	
147911	VERBINDUNGSTRGER	00	95	1.000	
147912	FHRUNGSROHR	00	96	1.000	
147913	DECKBLECH 2	00	97	1.000	
148179	GRIFFPLATTE 1	00	98	1.000	
148257	PRINTABDECKUNG	00	99	1.000	
259954	ZYL-STIFT 6 X12 VSM12771B	00	100	1.000	
251924	ZYL-SRIFT 3 X14 VSM12771B	00	101	1.000	
251932	ZYL.STIFT 4 X10 VSM12771B	00	102	24.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	103	1.000	
279279	SINTERBZ.LAGER 5E7/10R7/12 4+2	00	104	2.000	
422002	SPREIZNIETE KST D=5 KB=3.5-4.5	00	105	6.000	A
279365	SINTERBZ.LAGER 8E7/11R7/ 8 MM	00	106	3.000	
253021	GLEITLAGER 5D10/8X5	00	107	2.000	
361000	KABELBEF. L=100 B=2.5 MM	00	108	2.000	
361004	KABELBEF. CFCC-4 1/2”	00	109	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	110	49.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	111	114.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	113	10.000	
403491	SENKSCHRAUBE M 4X 8 DIN7991	00	116	4.000	
405062	GEW.STIFT VERZ M 4X 5 DIN913	00	118	5.000	
413045	RINGFEDER SCHWARZ NR.5 BN816	00	120	2.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	121	9.000	
420214	PT-SENKKOPFSCHRAUBE KA 30 X 8	00	122	1.000	A
420331	LINSENSCHR M3 X16 ISO7380	00	123	7.000	
511006	LOCTITE 222 50mL	00	124	0.000	T
258052	ZAHNRIEMEN MXL Z=546 X 3/16”	00	125	1.000	C
258053	ZAHNRIEMEN MXL Z= 83 X 3/16”	00	126	1.000	C
148248	KLETTVERSCHLUSS	00	127	4.000	A
420332	DRUCKSTUECK M4 X 9	00	128	1.000	
511032	SICOMET 8400	00	132	0.000	
256013	DRUCKFED d 0,4 Da 4 Lo 9,5	00	133	4.000	
148228	MODULE TRANSPORT FORK COMPL.	01	135	1.000	A
255385	IDENTIFIKATIONSLABEL ORANGE	00	150	1.000	

2.2.7 3D Drawing Entry Frame 147 317/1+3 revision 05

(page 1 of 2)


E2
E6
E9
E10
11(B)
14(A)
16(A)
17(A)
18(B)
21(C)
23(B)
13(A)
84(A)
91(A)
105(A)
122(A)
125(C)
126(C)
127(A)
110
111
113
116
118 124
2 124
128 124
1
27
28
29
30
31
32
33
34
35
36
40
41
42
45
46
52
53
56
57
59
62
63
65
66
67
68
69
70
71
72
73
74
75
77
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80
81
82
83
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87
88
89
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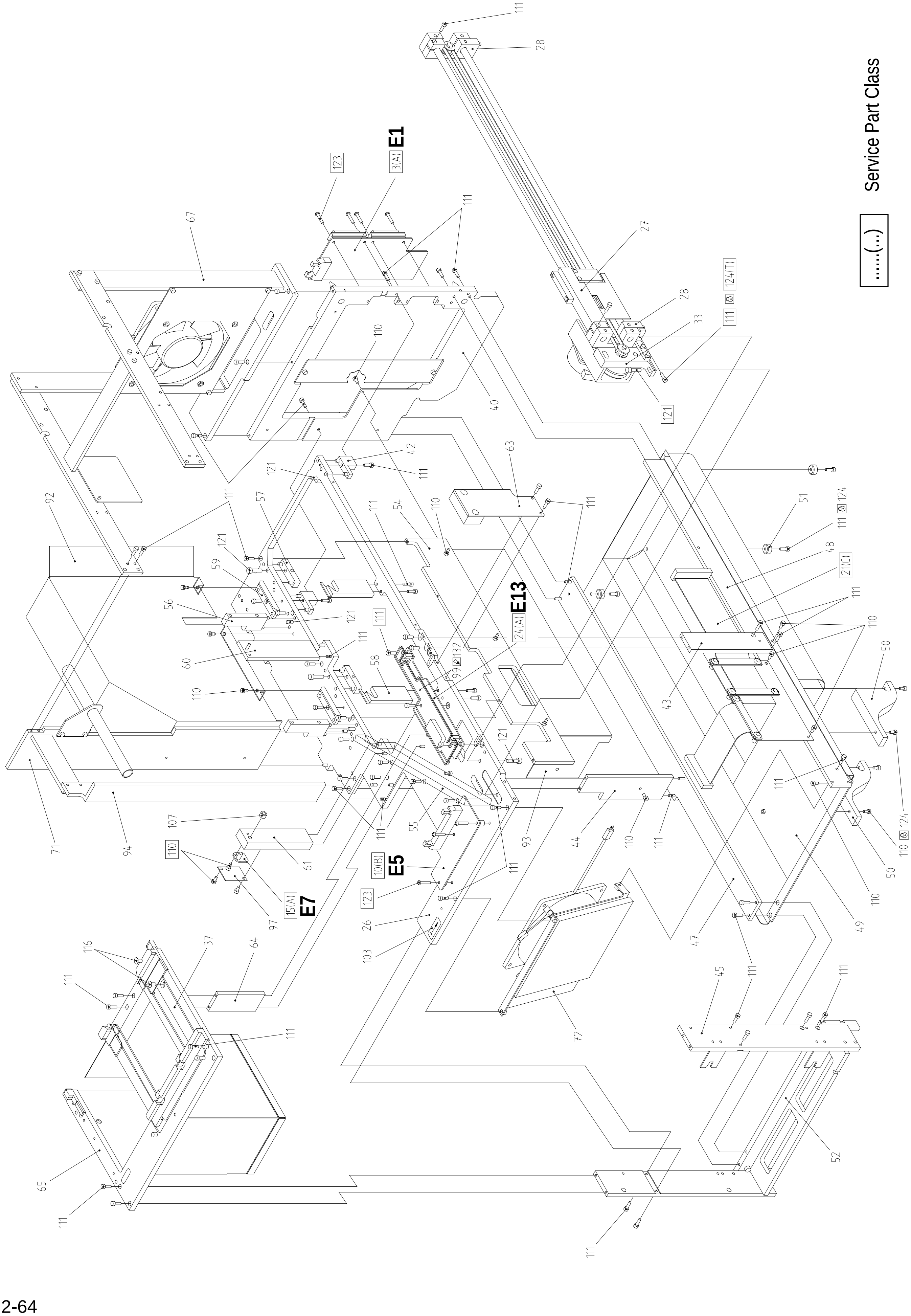
94
95
96
98
100
101
102
104
106
107
109
110
111
120
121
133
135

Service Part Class

......(...)

Entry Frame 147 317/2 revision 03 (page 2 of 2)

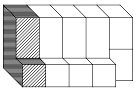

111
28
E1
3(A)
123
111
67
27
28
124(T)
33
111
121
110
40
42
111
121
63
92
111
57
54
110
111
51
124
111
48
21(C)
121
59
56
121
111
111
E13
24(A)
111
110
50
132
99
58
60
110
43
121
111
124
110
50
107
55
111
93
44
110
111
111
110
71
94
110
97
15(A)
E7
61
10(B)
E5
123
26
103
49
47
116
37
64
111
111
45
111
111
72
111
65
111
52
111

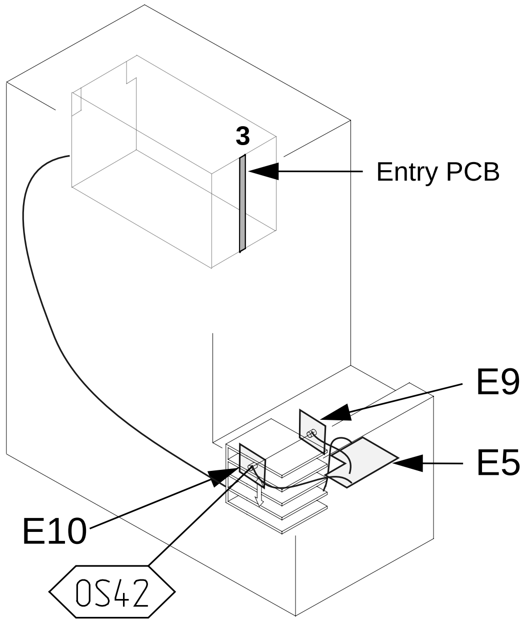
Service Part Class

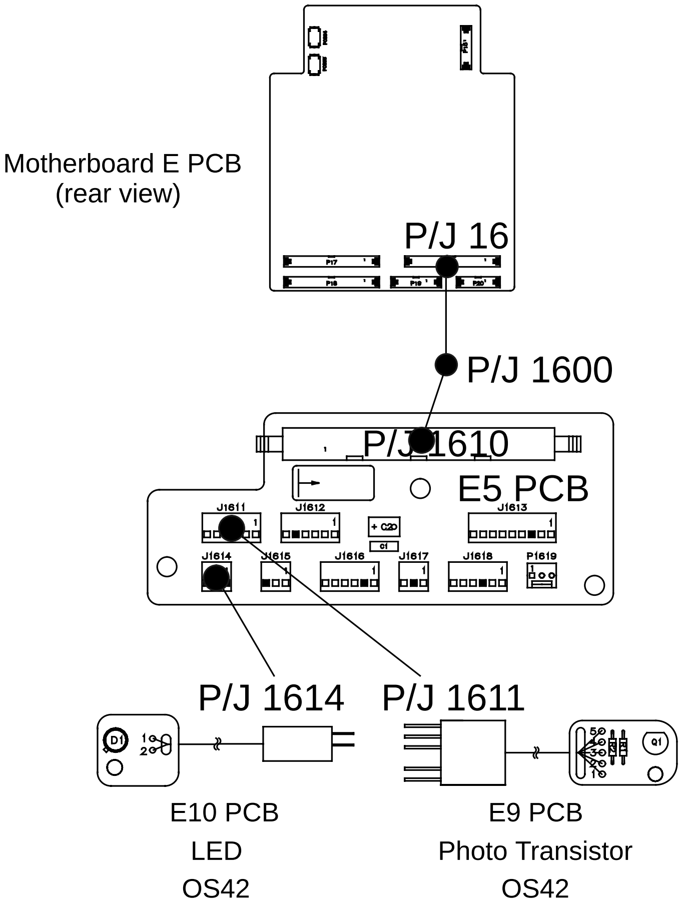
.....(...)

2.2.8 Troubleshooting

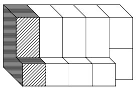
Module: Entry
Assembly: Frame
Sensor: MTP Sensor OS42 Entry Lift
Boards: E10, E9, E5, Entry PCB
Motherboard E
Error Message:

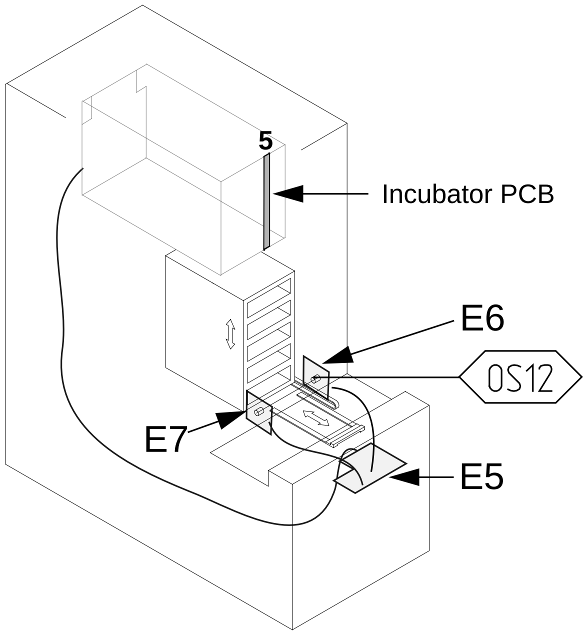


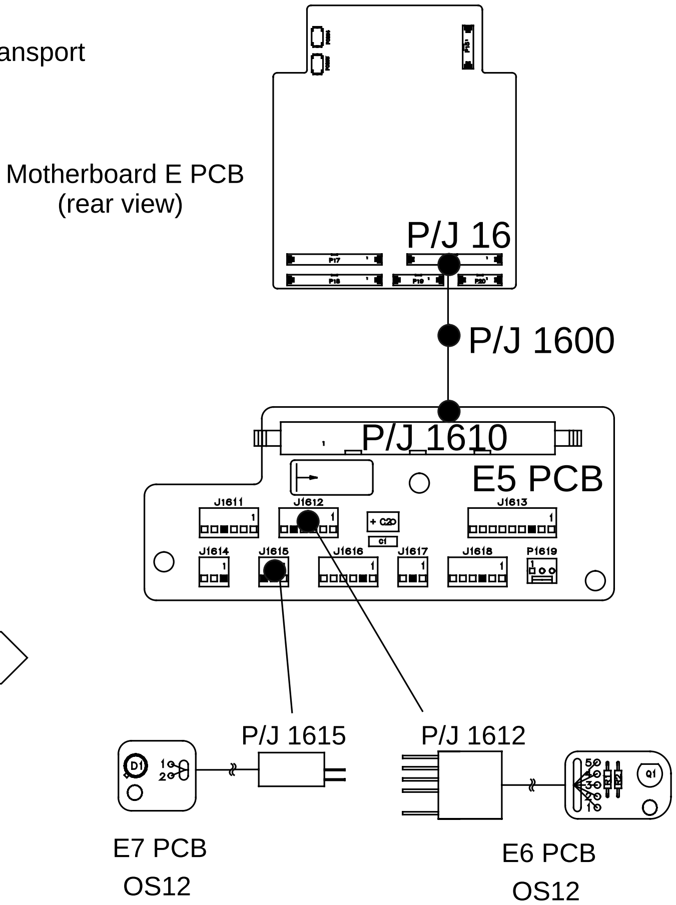

3
Entry PCB
E9
E5
E10
OS42


Motherboard E PCB
(rear view)
P/J 16
P/J 1600
P/J 1610
E5 PCB
J1611
J1612
J1613
J1614
J1615
J1616
J1617
J1618
P1619
P/J 1614
P/J 1611
E10 PCB
LED
OS42
E9 PCB
Photo Transistor
OS42

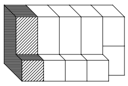
Module: Entry
Assembly: Frame
Sensor: MTP Sensor OS12 Module Transport
Boards: E7, E6, E5, Incubator PCB
Motherboard E
Error Message:

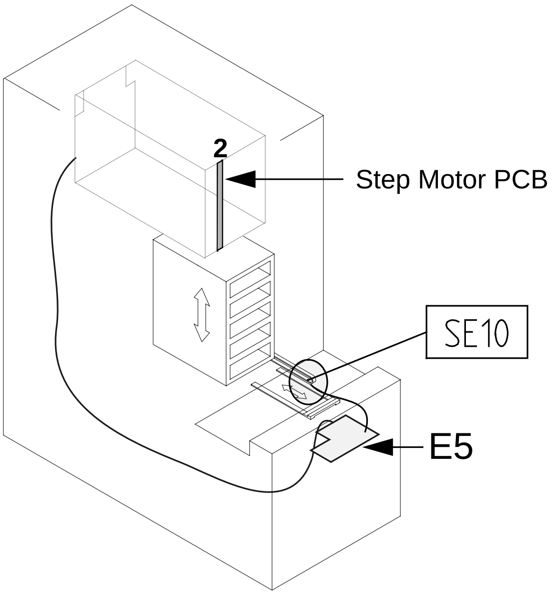


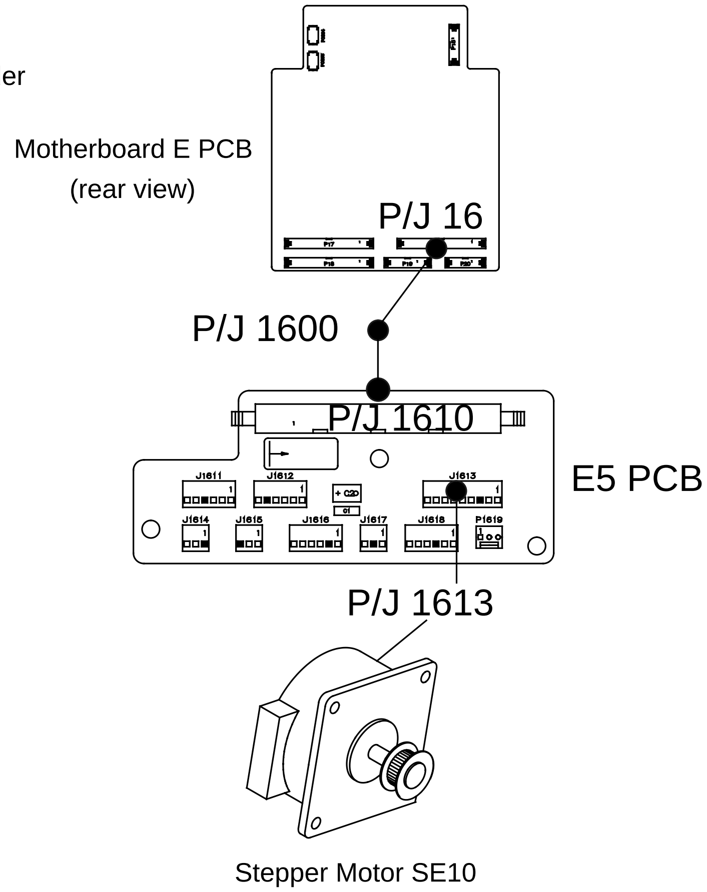

5
Incubator PCB
E6
OS12
E7
E5


Motherboard E PCB
(rear view)
P/J 16
P/J 1600
P/J 1610
E5 PCB
J1611
J1612
J1613
J1614
J1615
J1616
J1617
J1618
P1619
P/J 1615
P/J 1612
E7 PCB
OS12
E6 PCB
OS12

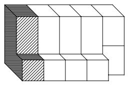
Module:	Entry
Assembly:	Frame
Actor:	Stepper Motor with Integrate Encoder SE10 Module Transport
Boards:	E5, Step Motor PCB Motherboard E
Error Message:	

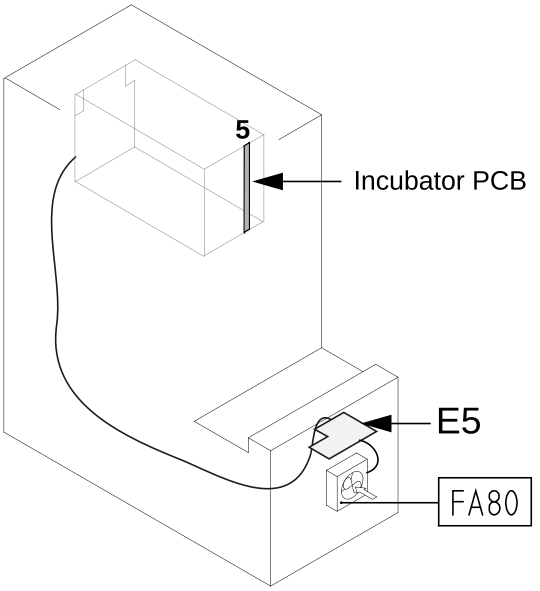


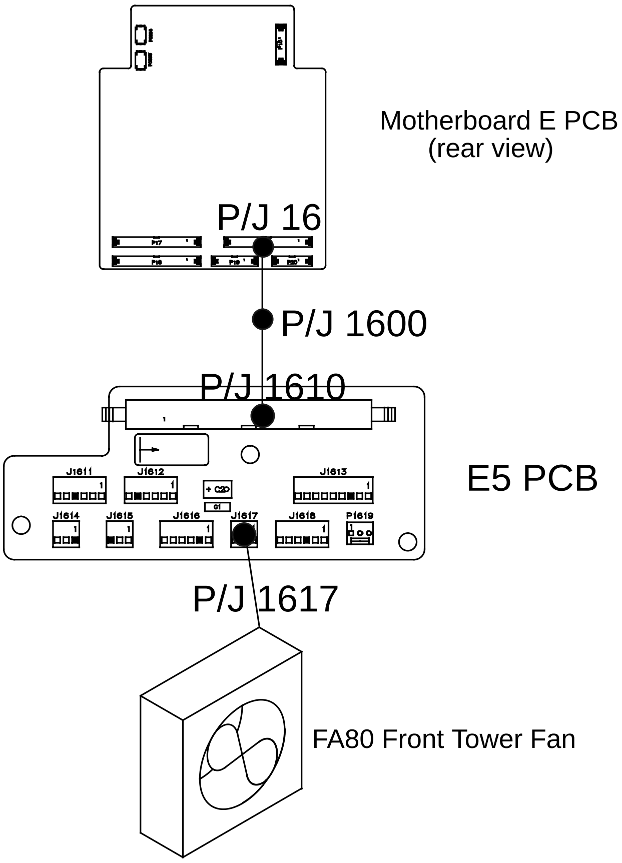

2
Step Motor PCB
SE10
E5


Motherboard E PCB
(rear view)
P/J 16
P/J 1600
P/J 1610
E5 PCB
J1611
J1612
J1613
J1614
J1615
J1616
J1617
J1618
P1619
P/J 1613
Stepper Motor SE10

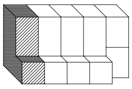
Module:	Entry
Assembly:	Frame
Actor:	FA80 Front Tower Fan
Boards:	E5, Incubator PCB Motherboard E
Error Message:	

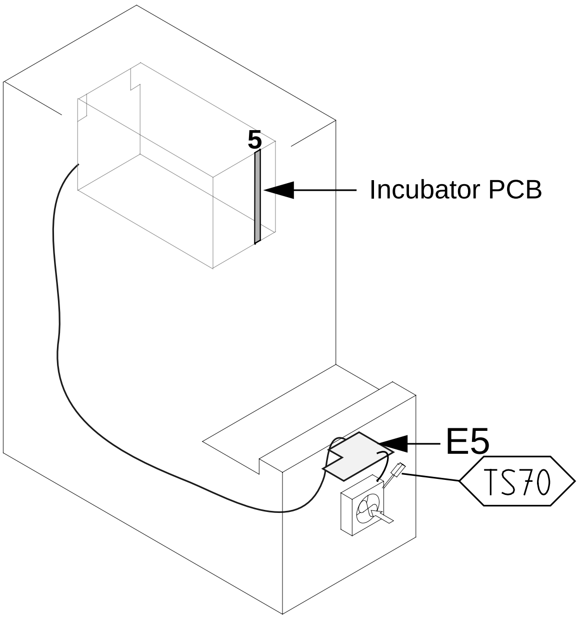


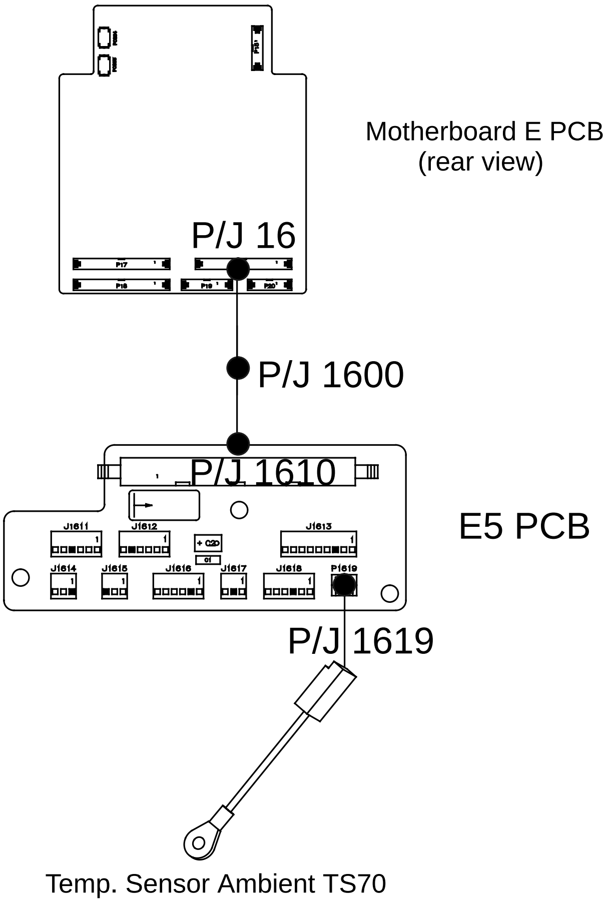

5
Incubator PCB
E5
FA80


Motherboard E PCB
(rear view)
P/J 16
P/J 1600
P/J 1610
E5 PCB
J1611
J1612
J1613
J1614
J1615
J1616
J1617
J1618
P1619
P/J 1617
FA80 Front Tower Fan

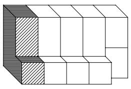
Module: Entry
Assembly: Frame
Sensor: Temp. Ambient TS70
Boards: E5, Incubator PCB
Motherboard E
Error Message:

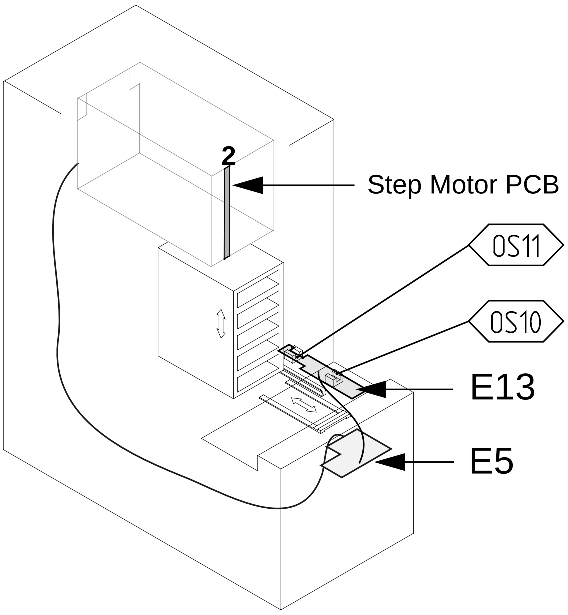


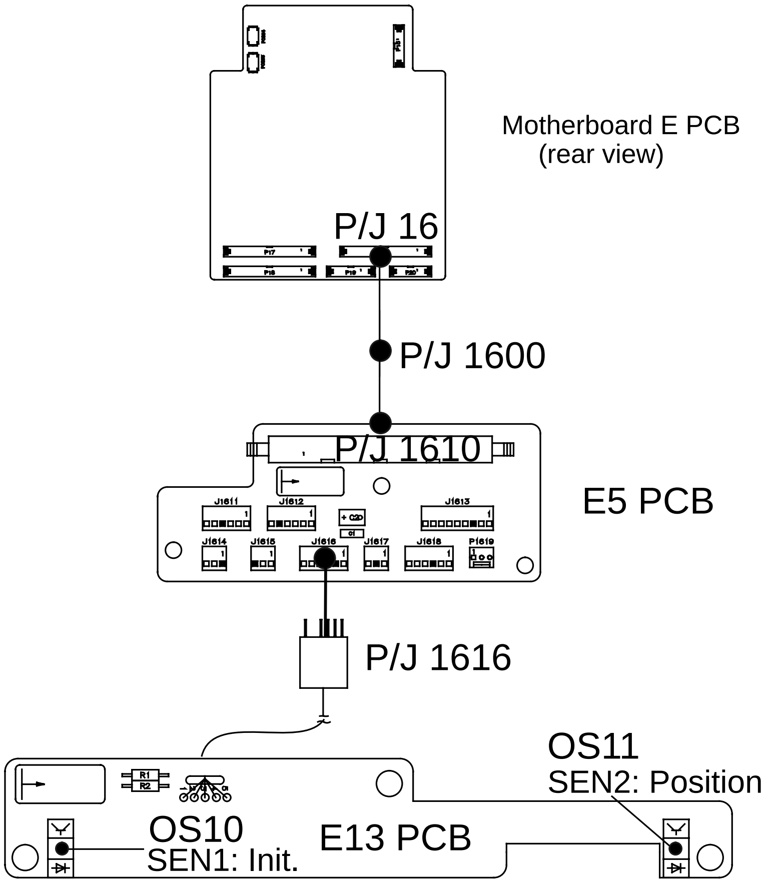

5
Incubator PCB
E5
TS70


Motherboard E PCB
(rear view)
P/J 16
P/J 1600
P/J 1610
E5 PCB
J1611
J1612
J1613
J1614
J1615
J1616
J1617
J1618
P1619
P/J 1619
Temp. Sensor Ambient TS70

Module: Entry
Assembly: Frame
Sensor: OS10 OS11 Module Transport
Boards: E13, E5, Step Motor PCB
Motherboard E
Error Message:




2
Step Motor PCB
OS11
OS10
E13
E5


Motherboard E PCB
(rear view)
P/J 16
P/J 1600
P/J 1610
E5 PCB
J1611
J1612
J1613
J1614
J1615
J1616
J1617
J1618
P1619
P/J 1616
OS11
SEN2: Position
OS10
SEN1: Init.
E13 PCB
R1
R2

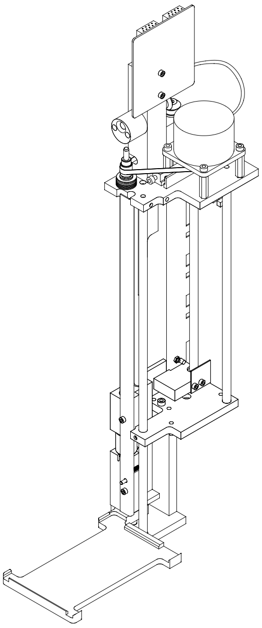
Entry Lift

147 262

- Functional Description
- Block Diagram
- Connector Boards

E 3	146 254
E 14	146 386

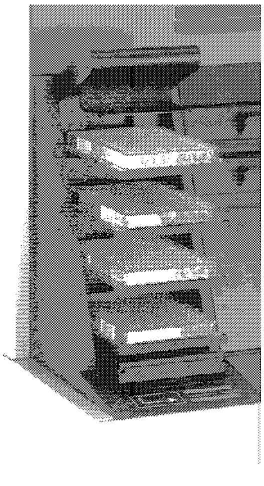
- Wiring Diagram
- Replacing Spare Parts
- Spare Parts List
- 3D Drawing
- Troubleshooting



2.3 Entry Lift 147 262

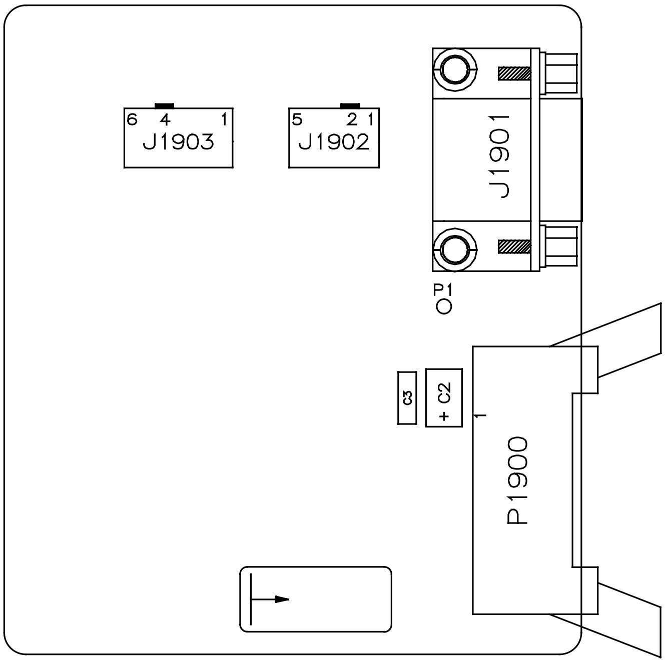
2.3.1 Functional Description

The Entry Lift raises and lowers the Entry Stack.

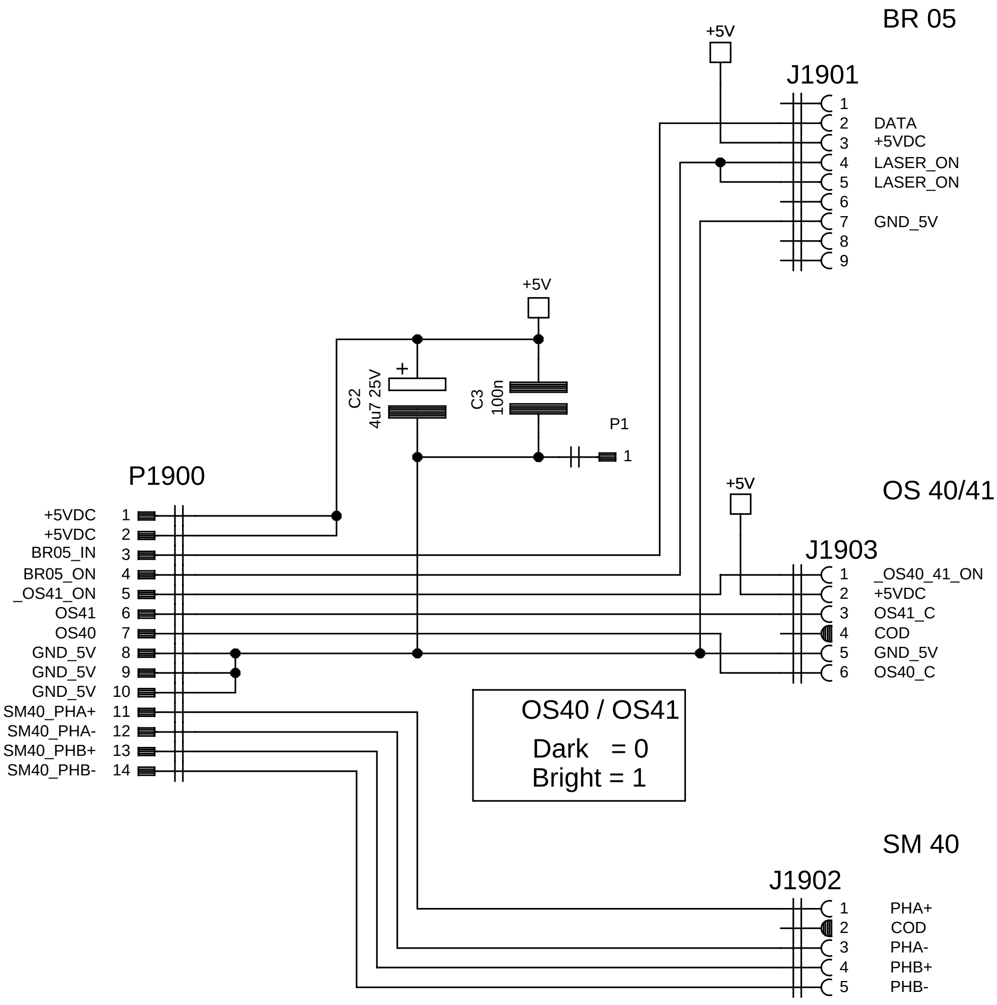


2.3.2 Connector Boards

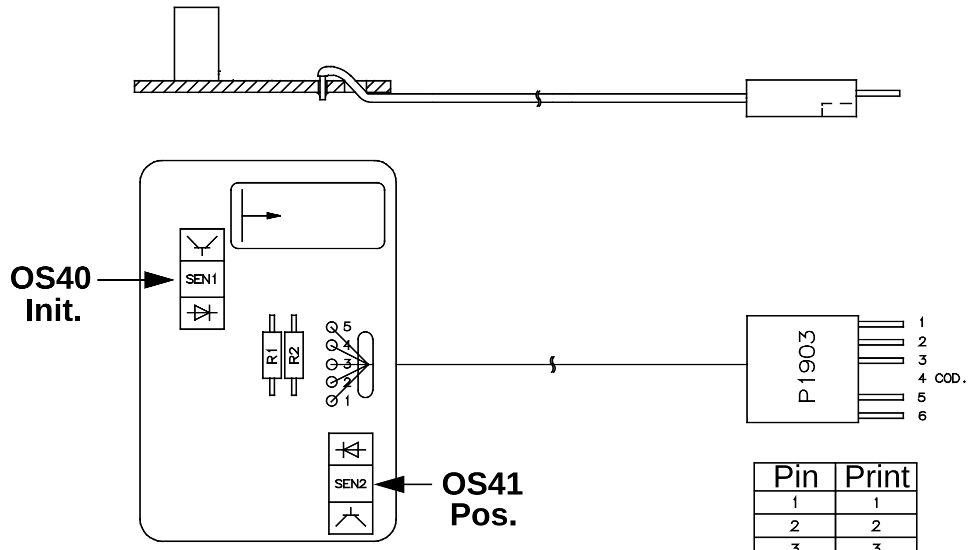
Connector Board E3 PCB Component Layout 146.254 revision 00


6 4 1
J1903
5 2 1
J1902
J1901
P1
C3
+ C2
1
P1900

Connector Board E3 PCB Entry Lift Board 604.830 revision 00

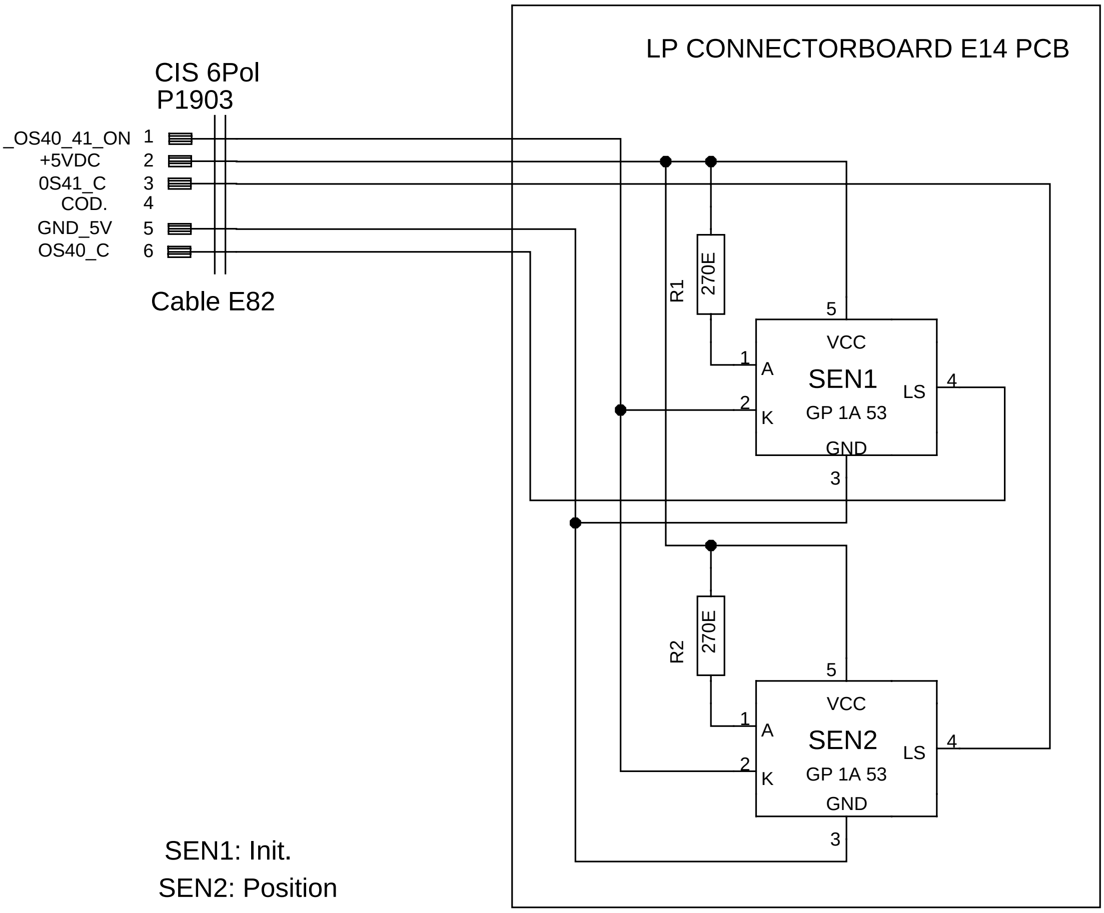

BR 05
+5V
J1901
1
2 DATA
3 +5VDC
4 LASER_ON
5 LASER_ON
6
7 GND_5V
8
9
+5V
C2 4u7 25V
C3 100n
P1
1
P1900
+5VDC 1
+5VDC 2
BR05_IN 3
BR05_ON 4
_OS41_ON 5
OS41 6
OS40 7
GND_5V 8
GND_5V 9
GND_5V 10
SM40_PHA+ 11
SM40_PHA- 12
SM40_PHB+ 13
SM40_PHB- 14
+5V
OS 40/41
J1903
1 _OS40_41_ON
2 +5VDC
3 OS41_C
4 COD
5 GND_5V
6 OS40_C
OS40 / OS41
Dark = 0
Bright = 1
SM 40
J1902
1 PHA+
2 COD
3 PHA-
4 PHB+
5 PHB-

Connector Board E14 PCB Component Layout 146.386 revision 00


OS40
Init.
SEN1
R1
R2
5
4
3
2
1
P1903
1
2
3
4 COD.
5
6
SEN2
OS41
Pos.

Pin	Print
1	1
2	2
3	3
4	–
5	4
6	5

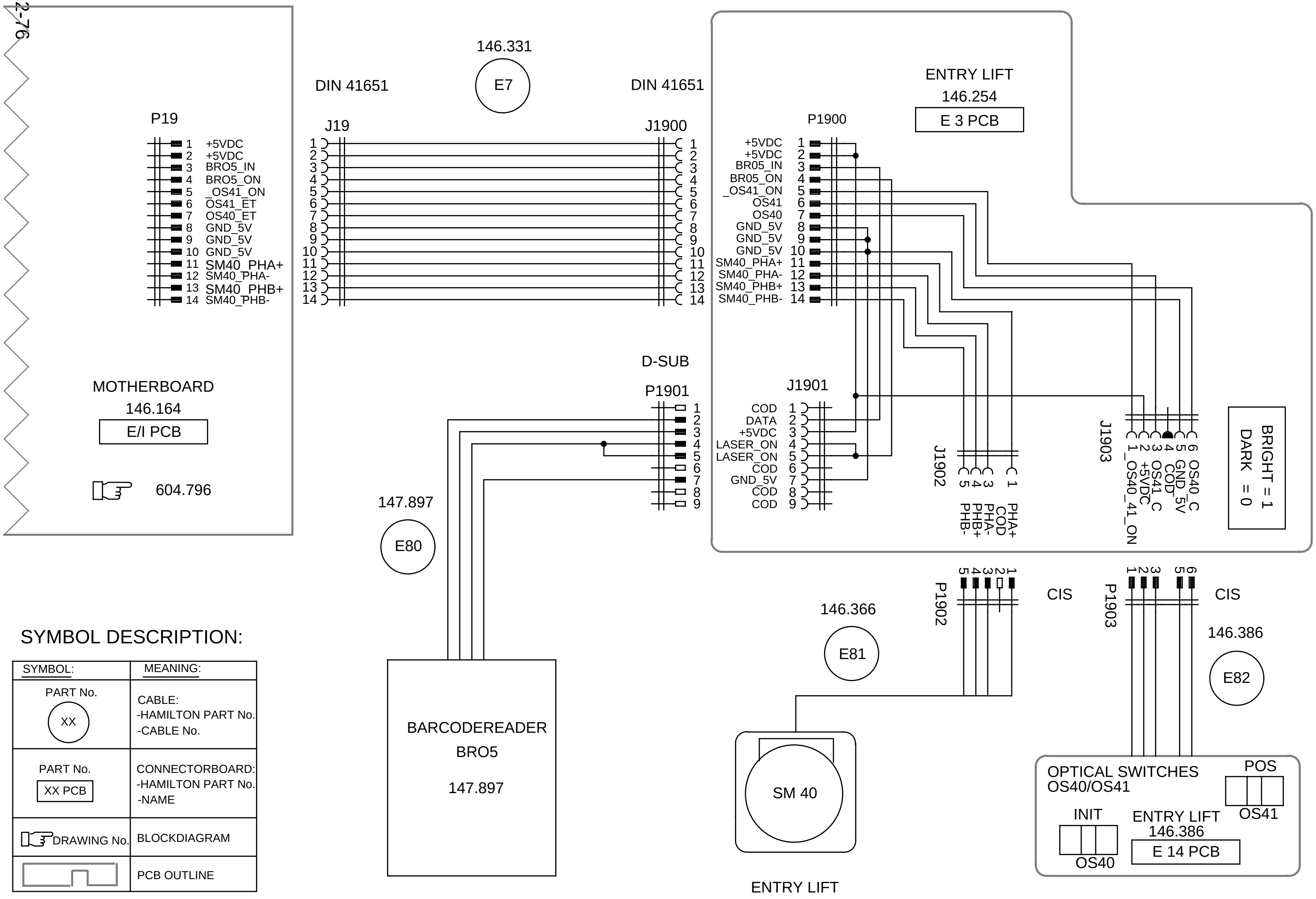
Connector Board E14 PCB OS40/41 604.849 revision 00


LP CONNECTORBOARD E14 PCB
CIS 6Pol
P1903
_OS40_41_ON 1
+5VDC 2
0S41_C 3
COD. 4
GND_5V 5
OS40_C 6
Cable E82
R1
270E
5
VCC
1
A
SEN1
LS
4
2
K
GP 1A 53
GND
3
R2
270E
5
VCC
1
A
SEN2
LS
4
2
K
GP 1A 53
GND
3

SEN1: Init.
SEN2: Position

2.3.3 Wiring Diagram

Entry Lift: 616 002 revision 00


P19
1 +5VDC
2 +5VDC
3 BRO5_IN
4 BRO5_ON
5 _OS41_ON
6 OS41_ET
7 OS40_ET
8 GND_5V
9 GND_5V
10 GND_5V
11 SM40_PHA+
12 SM40_PHA-
13 SM40_PHB+
14 SM40_PHB-
MOTHERBOARD
146.164
E/I PCB
604.796
DIN 41651
J19
146.331
E7
DIN 41651
J1900
1 2 3 4 5 6 7 8 9 10 11 12 13 14
ENTRY LIFT
146.254
E 3 PCB
P1900
+5VDC 1
+5VDC 2
BR05_IN 3
BR05_ON 4
_OS41_ON 5
OS41 6
OS40 7
GND_5V 8
GND_5V 9
GND_5V 10
SM40_PHA+ 11
SM40_PHA- 12
SM40_PHB+ 13
SM40_PHB- 14
D-SUB
P1901
1 2 3 4 5 6 7 8 9
J1901
COD 1
DATA 2
+5VDC 3
LASER_ON 4
LASER_ON 5
COD 6
GND_5V 7
COD 8
COD 9
J1902
1 PHA+
2 COD
3 PHA-
4 PHB+
5 PHB-
J1903
1 _OS40_41_ON
2 +5VDC
3 OS41_C
4 COD
5 GND_5V
6 OS40_C
BRIGHT = 1
DARK = 0
147.897
E80
BARCODEREADER
BRO5
147.897
146.366
E81
P1902
5 4 3 2 1
CIS
SM 40
ENTRY LIFT
P1903
1 2 3 5 6
CIS
146.386
E82
OPTICAL SWITCHES
OS40/OS41
POS
OS41
INIT
OS40
ENTRY LIFT
146.386
E 14 PCB

SYMBOL DESCRIPTION:

SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
☞ DRAWING No.	BLOCKDIAGRAM
⎍	PCB OUTLINE

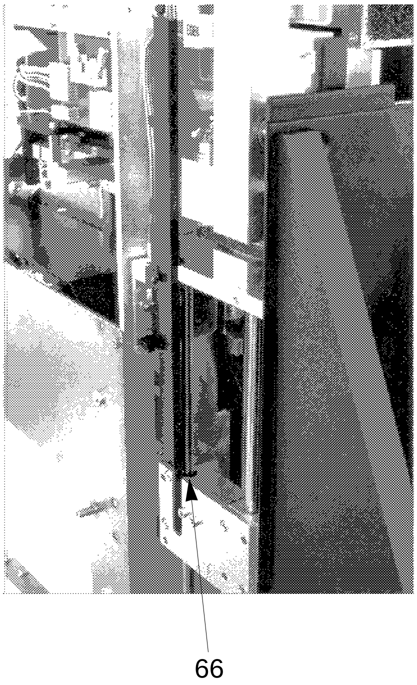
2.3.4 Replacing Spare Parts

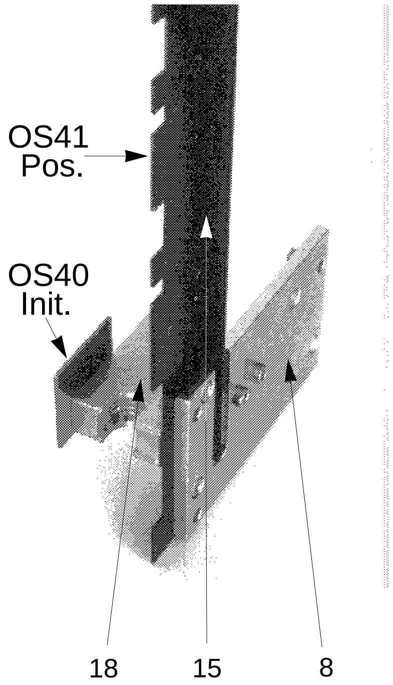
NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

2.3.4.1 Range flag item 15

Remove hood item 97 (see section 2.1.6).

Unscrew and remove the *guide plate (item 8)* complete with the *range flag (item 15).*





Unscrew *bearing support (item 18).*

Unscrew and replace the *range flag (item 15).*

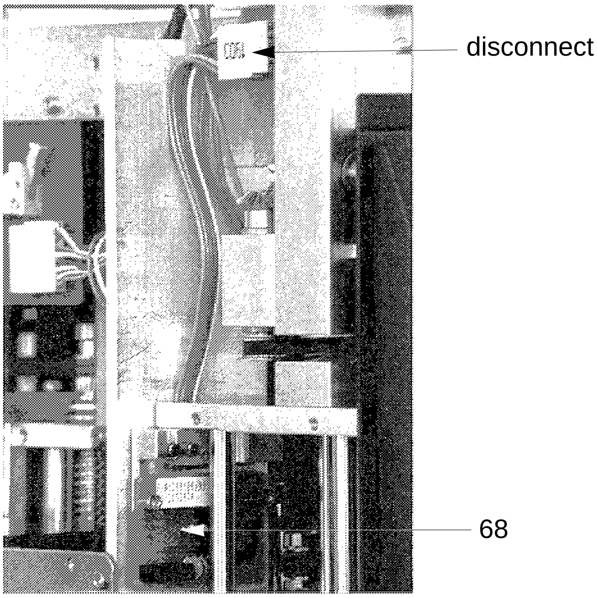
When remounting, do not forget to insert the *sintered bushing (item 66)* back into the *bearing support (item 18).*

2.3.4.2 Connector board E14 item 68

Unscrew *guide plate (item 8)* complete with the *range flag item 15* (see section 2.3.4.1).

Disconnect connector board E14 from connector board E3.

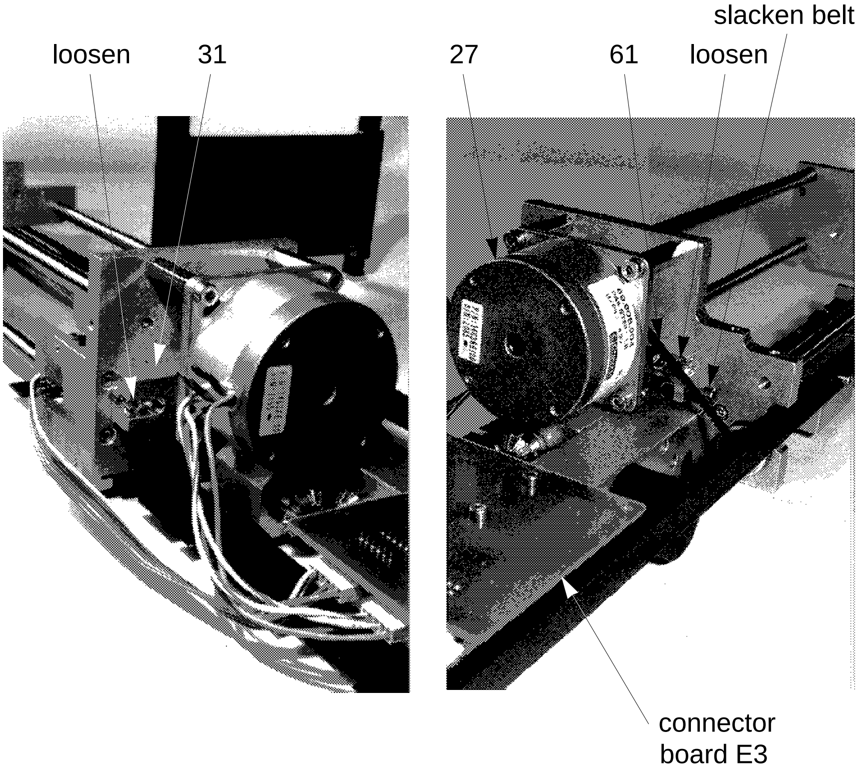
Unscrew and replace *connector board E14 (item 68)*.



2.3.4.3 Step motor item 27, and belt item 61

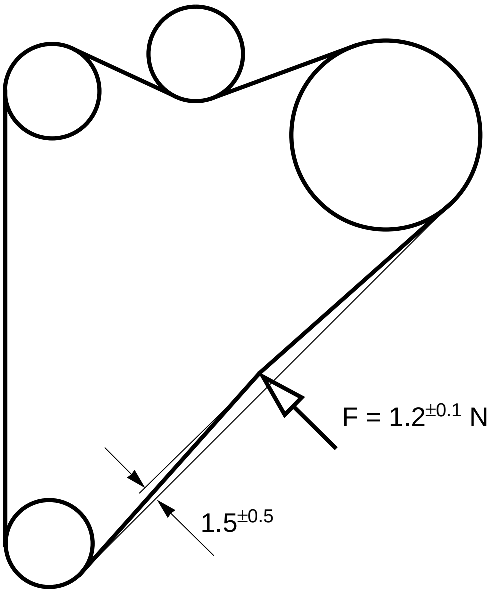
Remove *entry lift item 2* (see section 2.1.6.1).

Loosen the 2 screws fixing the *tension roller plate (item 31)*, then slacken the belt.


slacken belt
loosen
31
27
61
loosen
connector board E3

To remove belt, unscrew step motor. Belt can be slipped over connector board E3.

Belt tension:

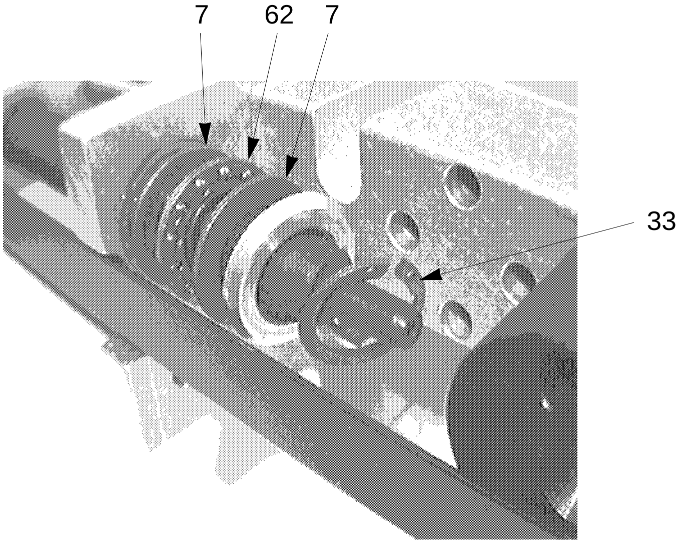

F = 1.2±0.1 N
1.5±0.5

2.3.4.4 Thrust bearing item 62 and thrust washer item 7

Remove *entry lift item 2* (see section 2.1.6.1).

Remove *stepper motor item 27* (see section 2.3.4.3) in order to slip belt off gear.

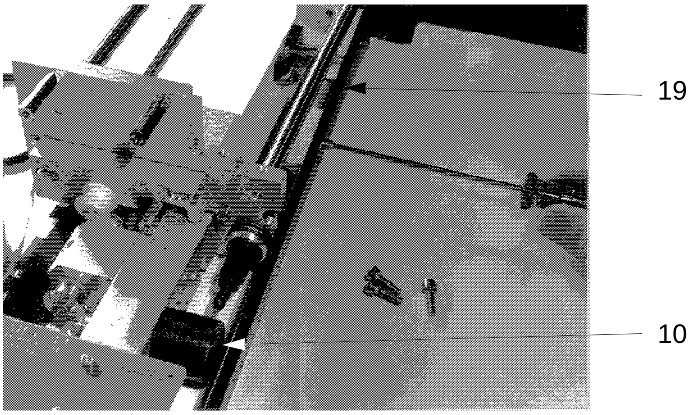
Now remove *retaining ring (item 33)* and replace thrust bearing and washers.



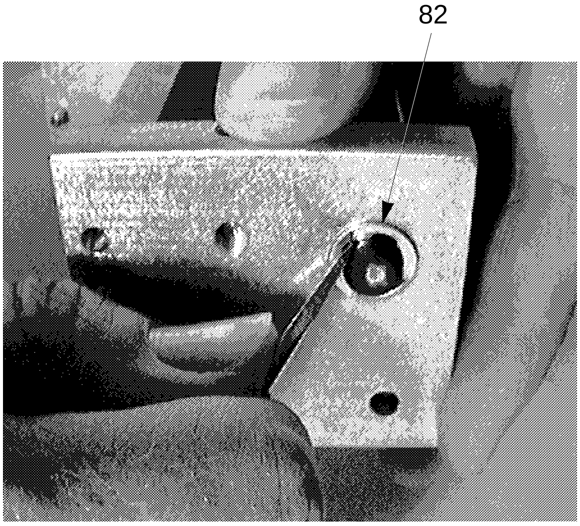
2.3.4.5 Lift nut item 28

Remove *entry lift item 2* (see section 2.1.6.1) and *stepper motor item 27* (see section 2.3.4.3).

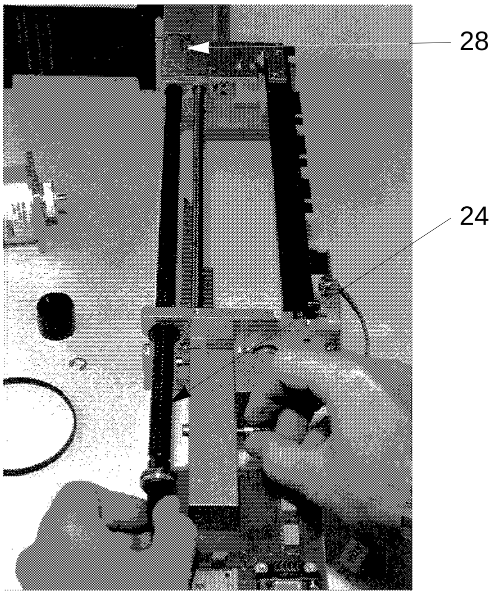
Unscrew and remove *spindle guard (item 19*) and *crank guide (item 10)*.



Remove *retaining ring (item 82)*.



Turn *lift drive spindle (item 24*) counterclockwise until nut is free.



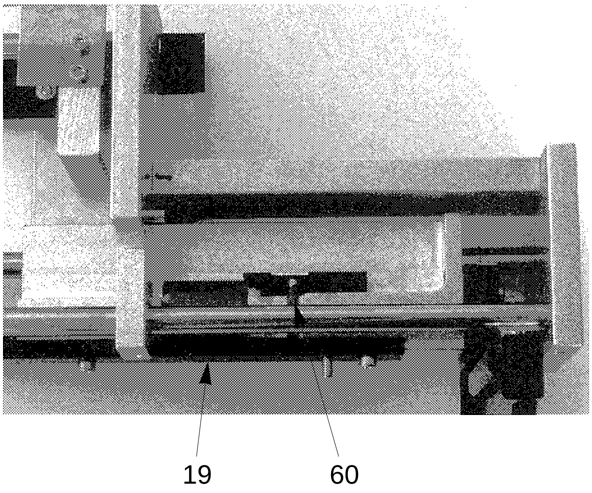
Press *pin (item 57*) into lift nut before installing nut.

2.3.4.6 Tension spring item 60

Remove *entry lift item 2* (see section 2.1.6.1).

Remove *spindle guard (item 19)* for better access.

Replace *tension spring (item 60).*



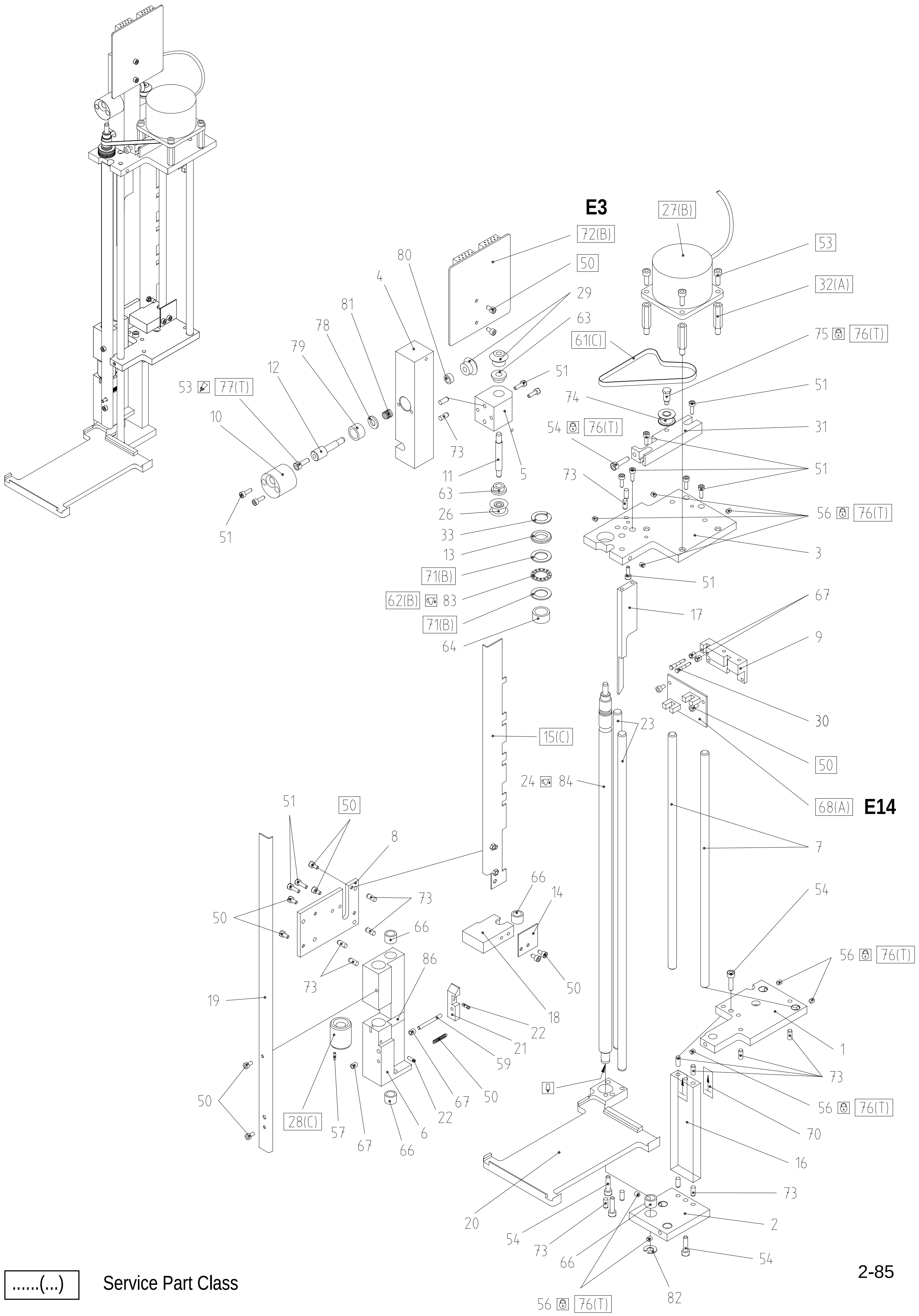
2.3.5 Spare Parts List

ENTRY LIFT 147 262 Revision: 01

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147263	BEFESTIGUNGSPLATTE	00	1	1.000	
147264	HALTEPLATTE UNTEN	00	2	1.000	
147265	HALTEPLATTE OBEN	00	3	1.000	
147266	GETRIEBELAGER	00	4	1.000	
147890	KEGELRADWELLENHALTER	00	5	1.000	
147268	ENTRYLIFT-SUPPORT	00	6	1.000	
147269	LEITWELLE	01	7	2.000	
147270	FUEHRUNGSPLATTE	00	8	1.000	
147271	LS-HALTEPLATTE	00	9	1.000	
148252	KURBELFUEHRUNG	00	10	1.000	
147273	KEGELRADWELLE	00	11	1.000	
147274	HANDANTRIEBSWELLE	00	12	1.000	
147275	LAGERRING	00	13	1.000	
147276	INITFAHNE	00	14	1.000	
147277	BEREICHSFAHNE	00	15	1.000	C
147278	STUETZE	00	16	1.000	
147279	ANSCHLAG	01	17	1.000	
147826	LAGERHALTER	00	18	1.000	
147917	SPINDELABDECKUNG	00	19	1.000	
147281	HEBEBUEHNE	00	20	1.000	
147283	VERRIEGELUNGSNOCKEN	01	21	1.000	
147284	FEDERHALTESTIFT	00	22	2.000	
147285	FUEHRUNGSWELLE	01	23	2.000	
147286	HUBSPINDEL	01	24	1.000	
147945	ZAHNRIEMENRAD Z=20	00	26	1.000	
146366	STEP MOTOR E SM40	00	27	1.000	B
147290	SPINDELMUTTER	00	28	1.000	C
261005	KEGELRAD Z= 16 M= 1.0	00	29	2.000	
147656	BOLZEN	00	30	2.000	
147891	SPANNROLLENHALTER	00	31	1.000	
257041	DIST.HALTER M4X 25 I/A GEW.	00	32	3.000	A
414241	SICHERUNGSRING-V D=12 SEEGER V	00	33	1.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	50	12.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	51	13.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	53	4.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	54	5.000	
405462	GEW.STIFT M4 X 5 VERZ DIN916	00	56	9.000	
251903	ZYL-STIFT 2 X 8 VSM12771B	00	57	1.000	
279163	ZYL-STIFT 3,0X30 VSM12771B	00	59	1.000	
256115	ZUGFED. D 0,32 DA 3,52 LO 12,9	00	60	1.000	A
258000	ZAHNRIEMEN MXL Z=114x3116	00	61	1.000	B
250600	AXIALLAGER ID= 12.2 AD= 19 B=2	00	62	1.000	B
279361	SINTERBZ.LAGER 6E7/10R7/14 4+2	00	63	2.000	
253005	SINTERBZ.LAGER 12E7/16r7/ 8MM	00	64	1.000	
279365	SINTERBZ.LAGER 8E7/11R7/ 8 MM	00	66	4.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
253006	GLEITLAGER ZYL. 3X4.5 X 5	00	67	4.000	
146386	CONNECTORBOARD E14 PCB	00	68	1.000	A
255037	KENNZEICHNUNGS LABEL 30 X 12	00	70	1.000	
250601	GEGENSCHEIBE	00	71	2.000	B
146254	CONNECTORBOARD E3 PCB	00	72	1.000	B
251123	ZYL-STIFT 4.0X10 DIN6325	00	73	15.000	
148262	ROLLE 1	01	74	1.000	
137609	ACHSSCHRAUBE	00	75	1.000	
511006	LOCTITE 222 50mL	00	76	0.000	T
511010	LOCTITE 638 50mL	00	77	0.000	T
409403	U-SCHEIBE M6 DIN125A	00	78	1.000	
253016	SINTERBZ.LAGER 10E7/14r7 8MM	00	79	1.000	
253017	SINTERBZ.LAGER 6E7/9r7 4MM	00	80	1.000	
256122	DRUCKFEDER DA 7.6 L 15	00	81	1.000	A
413007	SICHERUNGSSCHEIBE 6 DIN6799	00	82	1.000	C
510000	SCHMIERFETT LGMT 2/0,2 SKF	00	83	0.000	T
511058	MOLYKOTE FETTPASTE DX	00	84	0.000	
7281149	PTFE-KLEBEBAND EXTR.B=9MM	00	86	0.030	

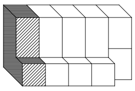
2.3.6 3D Drawing Entry Lift 147 262 revision 03

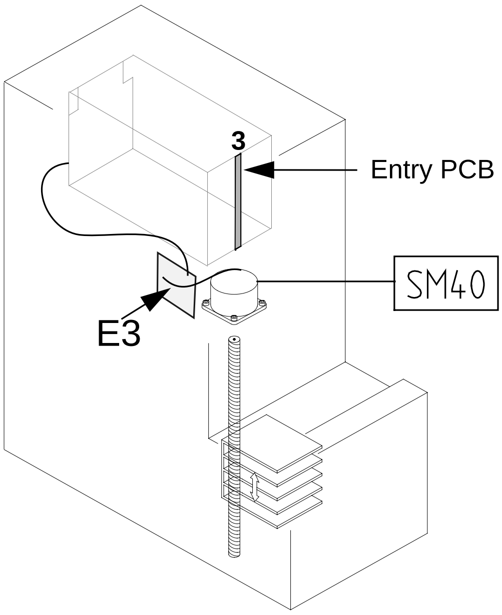

E3
27(B)
72(B)
53
50
80
4
32(A)
29
63
81
78
61(C)
75 76(T)
79
12
51
53 77(T)
74
51
10
54 76(T)
31
73
11
5
73
51
63
56 76(T)
26
33
3
13
51
51
71(B)
67
62(B) 83
17
71(B)
9
64
30
23
15(C)
50
24 84
68(A)
E14
51
50
7
8
66
54
14
73
50
66
56 76(T)
86
50
73
18
1
19
22
21
59
73
50
67
50
56 76(T)
28(C)
22
70
57
6
67
66
16
73
2
20
54
73
54
66
82
56 76(T)

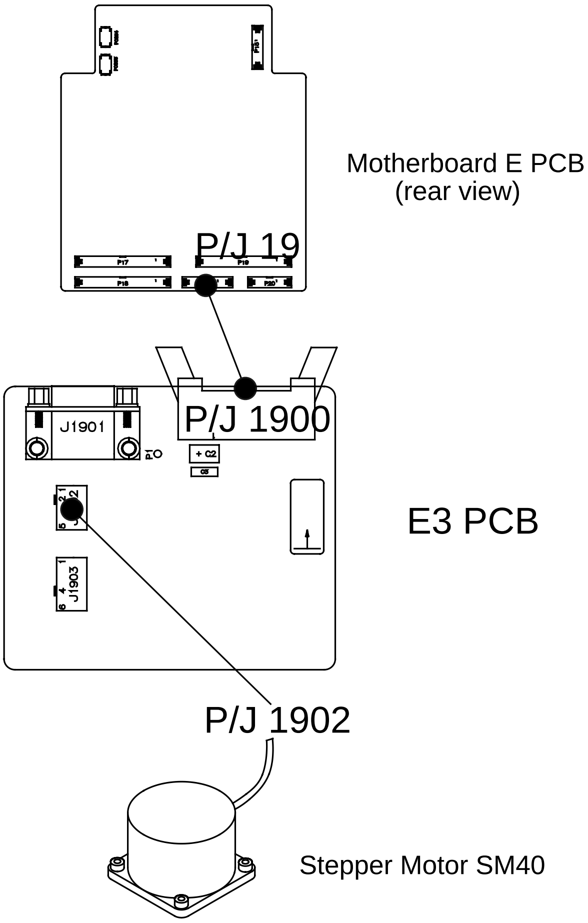
......(...) Service Part Class

2.3.7 Troubleshooting

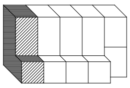
Module:	Entry
Assembly:	Entry Lift
Actor:	Stepper Motor SM40
Boards:	E3, Entry PCB Motherboard E
Error Message:	

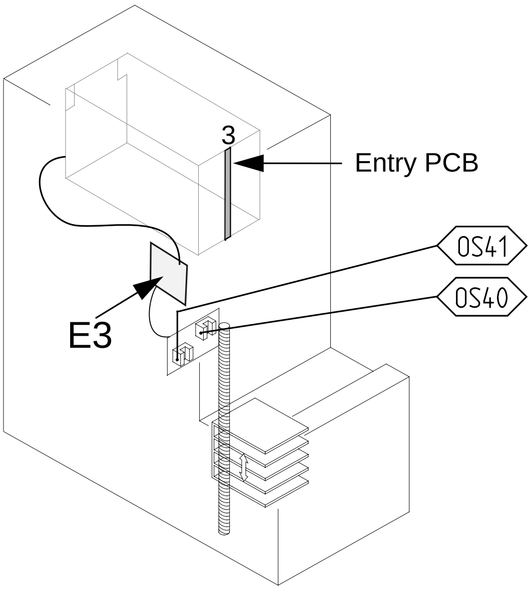


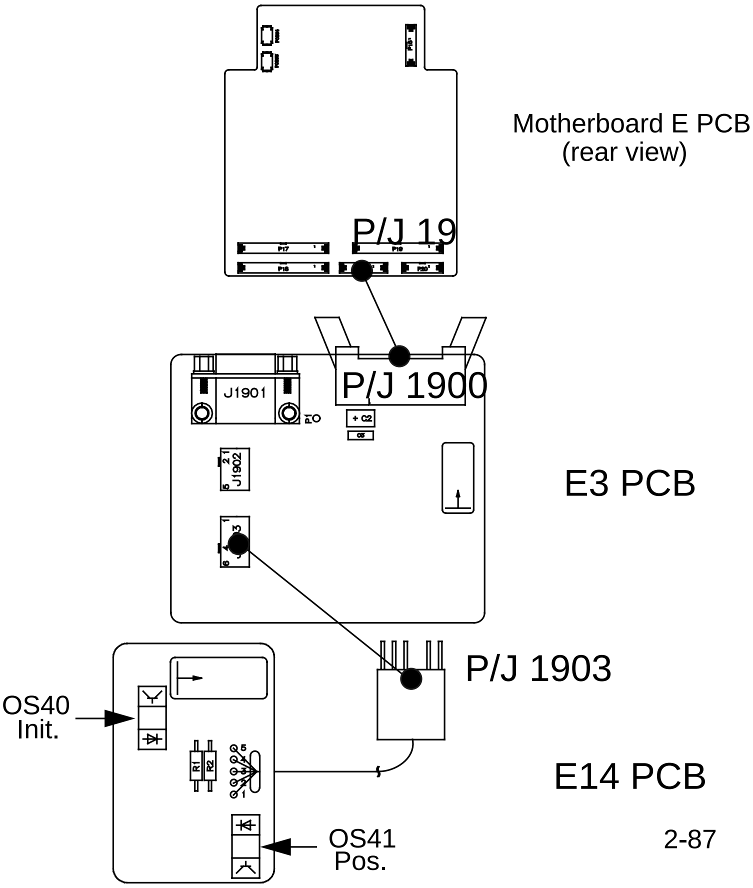

3
Entry PCB
SM40
E3


Motherboard E PCB
(rear view)
P/J 19
J1901
P/J 1900
E3 PCB
J1903
P/J 1902
Stepper Motor SM40

Module:	Entry
Assembly:	Entry Lift
Sensor:	Optical Switches OS40 / OS41
Boards:	E14, E3, Entry PCB Motherboard E
Error Message:	




3
Entry PCB
OS41
OS40
E3


Motherboard E PCB
(rear view)
P/J 19
J1901
P/J 1900
E3 PCB
J1902
P/J 1903
OS40
Init.
R1
R2
E14 PCB
OS41
Pos.

Incubator Tower Ambient

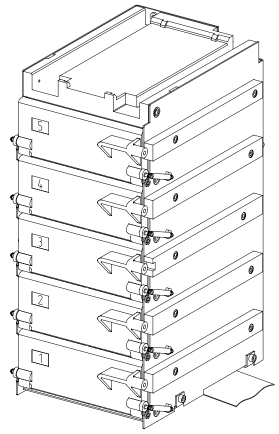
147 682

- Spare Parts List

Incubator Tower Controlled

147 466

- Functional Description
- Connector Board
  - E 4   146 250
- Wiring Diagram
- Replacing Spare Parts
- Spare Parts List
- 3D Drawing
- Troubleshooting (Front & Rear Tower)



2.4 Incubator Towers

2.4.1 Incubator Tower Ambient Temp. 147 682

2.4.1.1 Functional Description

See section 2.4.2 Incubator Tower Controlled Temp. 147 466.

2.4.1.2 Block Diagram

See section 2.4.2 Incubator Tower Controlled Temp. 147 466.

2.4.1.3 Connector Board

See section 2.4.2 Incubator Tower Controlled Temp. 147 466.

2.4.1.4 Wiring Diagram

See section 2.4.2 Incubator Tower Controlled Temp. 147 466.

2.4.1.5 3D Drawing

See section 2.4.2 Incubator Tower Controlled Temp. 147 466.

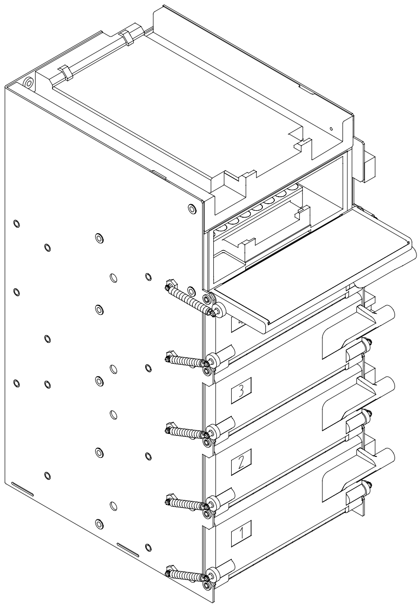
2.4.1.6 Replacing Spare Parts

Refer to section 2.4.2.4.

2.4.1.7 Spare Parts List

INCUBATOR TOWER AMBIENT TEMP. 147 682 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147467	KAMMERGEHAEUSE	00	1	5.000	
147468	AUFLAGEPLATTE	00	2	5.000	
147469	PLATTENPODEST	00	3	5.000	
147470	KAMMERISOLATION	00	4	5.000	
147471	TOWERGEHAEUSE	00	5	1.000	
147472	TOWERDECKPLATTE	00	6	1.000	
147473	KAMMERTUER	00	7	5.000	
147474	TUERBLECH	00	9	5.000	
147475	FEDERHALTESCHRAUBE	00	10	10.000	
147476	FEDERHALTESTIFT	00	11	10.000	
279073	ZYL-STIFT 2,5X10 VSM12771B	00	12	10.000	
147478	FUEHRUNG 1	00	13	3.000	
147479	FUEHRUNG 2	01	14	1.000	
147480	FUEHRUNG 3	00	15	1.000	
146308	TEMPERATURE SENSOR TS70	00	16	6.000	A
147477	KAMMERISOLIERMATTE	00	17	5.000	B
146250	CONNECTORBOARD E4 PCB	00	18	1.000	B
257036	DISTANZHALTER M3 X 8 I/I GEW.	00	20	5.000	A
256116	ZUGFEDER D 0.50 DM 3.0 LO 24.5	00	21	10.000	A
420214	PT-SENKKOPFSCHRAUBE KA 30 X 8	00	22	43.000	A
403452	SENKSCHRAUBE M 3X 6 DIN7991	00	23	10.000	
400263	ZYL-SCHR.M 3X 8 DIN912 A2	00	24	14.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	25	15.000	
146286	CABLE E22	00	26	5.000	C
411001	FCHERSCHEIBE M3 DIN6798	00	27	5.000	
148243	VERBINDUNGSBOLZEN	00	28	5.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	29	1.000	
147995	TUERISOLATION	00	30	5.000	
255039	TUERBESCHRIFTUNG	00	31	1.000	



2.4.2 Incubator Tower Controlled Temp. 147 466

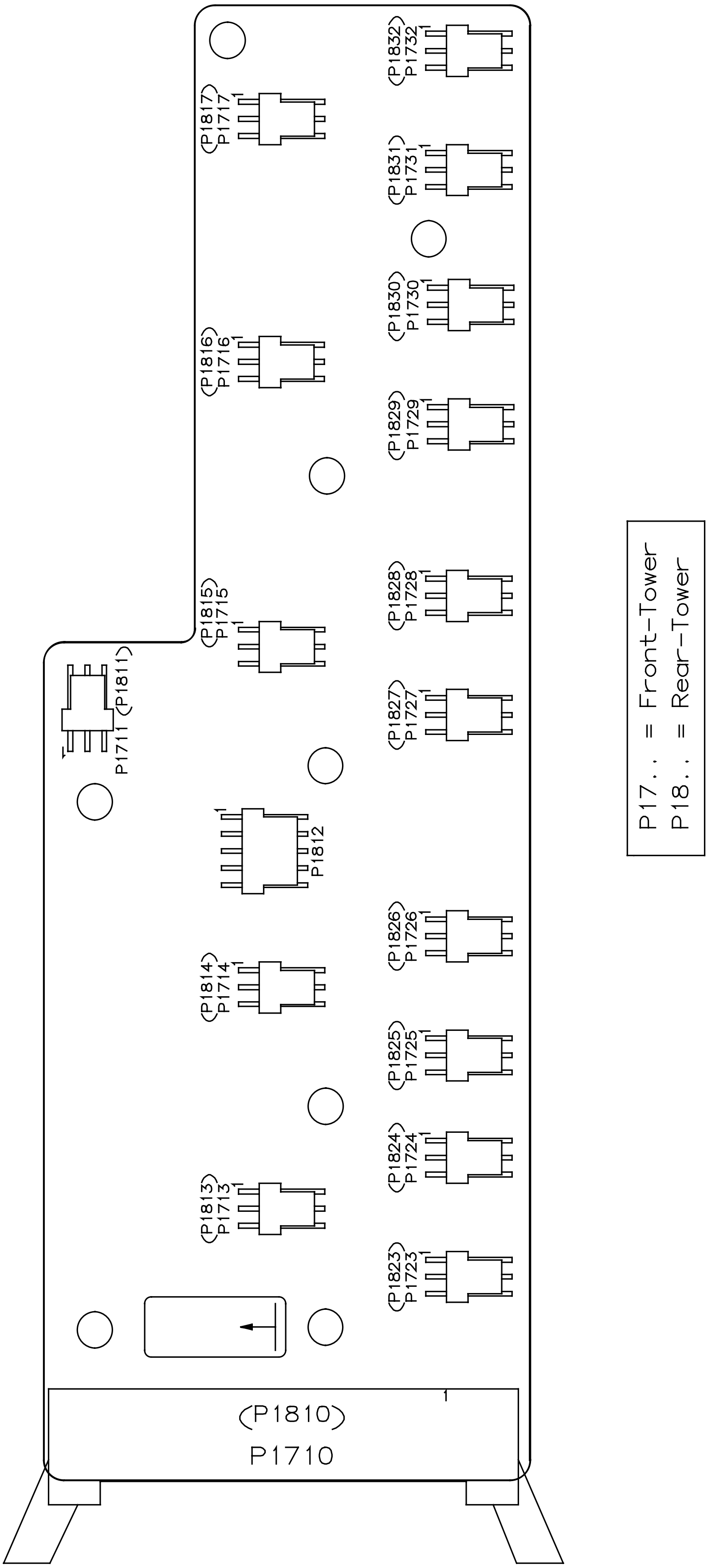
2.4.2.1 Functional Description

The Entry Module contains two incubator towers each with 5 incubation slots. The front tower is used for ambient temperature incubation only. The rear tower is used for ambient temperature or for temperature-controlled incubation. The temperature can be set up to 45°C. A plate can be loaded individually into each slot. The incubation time for each slot can also be defined individually.

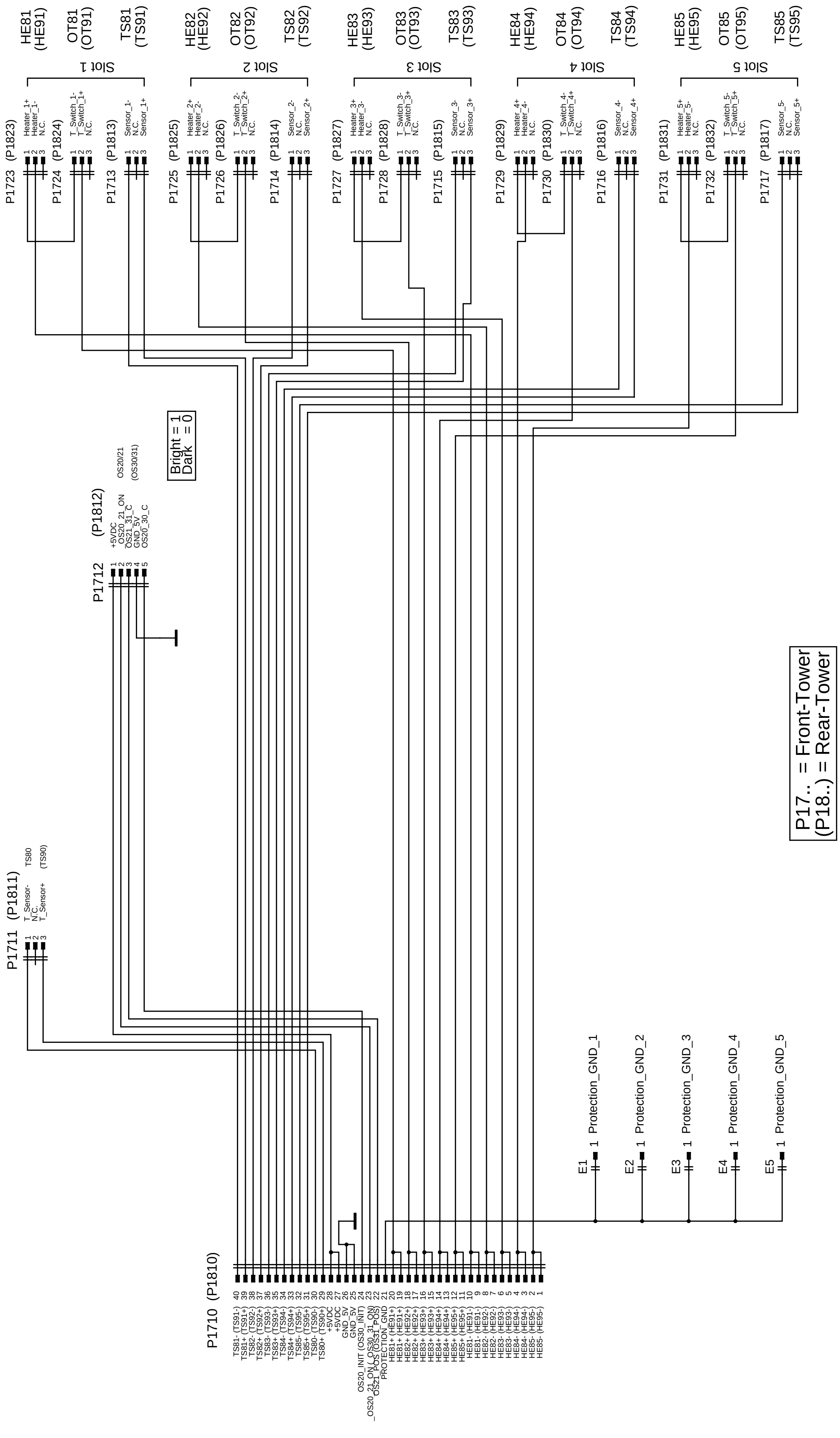
NOTE
All slots within the same incubation tower have the same temperature. They are not individually programmable. However, each slot is individually temperature controlled. Each slot has a booster heater to maintain the required temperature during plate loading (when the door is open).

2.4.2.2 Connector Board

Connector Board E4 PCB Component Layout 146.250 revision 00


(P1832) P1732
(P1817) P1717
(P1831) P1731
(P1830) P1730
(P1816) P1716
(P1829) P1729
(P1828) P1728
(P1815) P1715
(P1811) P1711
(P1827) P1727
P1812
(P1826) P1726
(P1814) P1714
(P1825) P1725
(P1824) P1724
(P1813) P1713
(P1823) P1723
(P1810)
P1710
1
P17.. = Front-Tower
P18.. = Rear-Tower

Connector Board E4 PCB Front - Rear - Tower Board 604.828 revision 00


HE81 (HE91)
OT81 (OT91)
TS81 (TS91)
Slot 1
HE82 (HE92)
OT82 (OT92)
TS82 (TS92)
Slot 2
HE83 (HE93)
OT83 (OT93)
TS83 (TS93)
Slot 3
HE84 (HE94)
OT84 (OT94)
TS84 (TS94)
Slot 4
HE85 (HE95)
OT85 (OT95)
TS85 (TS95)
Slot 5
P1723 (P1823) 1 Heater_1+ 2 Heater_1- 3 N.C.
P1724 (P1824) 1 T_Switch_1- 2 T_Switch_1+ 3 N.C.
P1713 (P1813) 1 Sensor_1- 2 N.C. 3 Sensor_1+
P1725 (P1825) 1 Heater_2+ 2 Heater_2- 3 N.C.
P1726 (P1826) 1 T_Switch_2- 2 T_Switch_2+ 3 N.C.
P1714 (P1814) 1 Sensor_2- 2 N.C. 3 Sensor_2+
P1727 (P1827) 1 Heater_3+ 2 Heater_3- 3 N.C.
P1728 (P1828) 1 T_Switch_3- 2 T_Switch_3+ 3 N.C.
P1715 (P1815) 1 Sensor_3- 2 N.C. 3 Sensor_3+
P1729 (P1829) 1 Heater_4+ 2 Heater_4- 3 N.C.
P1730 (P1830) 1 T_Switch_4- 2 T_Switch_4+ 3 N.C.
P1716 (P1816) 1 Sensor_4- 2 N.C. 3 Sensor_4+
P1731 (P1831) 1 Heater_5+ 2 Heater_5- 3 N.C.
P1732 (P1832) 1 T_Switch_5- 2 T_Switch_5+ 3 N.C.
P1717 (P1817) 1 Sensor_5- 2 N.C. 3 Sensor_5+
Bright = 1
Dark = 0
OS20/21
(OS30/31)
P1712 (P1812) 1 +5VDC 2 OS20_21_ON 3 OS21_31_C 4 GND_5V 5 OS20_30_C
P1711 (P1811) 1 T_Sensor- 2 N.C. 3 T_Sensor+
TS80
(TS90)
P17.. = Front-Tower
(P18..) = Rear-Tower
E1 1 Protection_GND_1
E2 1 Protection_GND_2
E3 1 Protection_GND_3
E4 1 Protection_GND_4
E5 1 Protection_GND_5
P1710 (P1810)
40 TS81- (TS91-)
39 TS81+ (TS91+)
38 TS82- (TS92-)
37 TS82+ (TS92+)
36 TS83- (TS93-)
35 TS83+ (TS93+)
34 TS84- (TS94-)
33 TS84+ (TS94+)
32 TS85- (TS95-)
31 TS85+ (TS95+)
30 TS80- (TS90-)
29 TS80+ (TS90+)
28 +5VDC
27 +5VDC
26 GND_5V
25 GND_5V
24 OS20_INIT (OS30_INIT)
23 _OS20_21_ON (_OS30_31_ON)
22 OS21_POS (OS31_POS)
21 PROTECTION_GND
20 HE81+ (HE91+)
19 HE81+ (HE91+)
18 HE82+ (HE92+)
17 HE82+ (HE92+)
16 HE83+ (HE93+)
15 HE83+ (HE93+)
14 HE84+ (HE94+)
13 HE84+ (HE94+)
12 HE85+ (HE95+)
11 HE85+ (HE95+)
10 HE81- (HE91-)
9 HE81- (HE91-)
8 HE82- (HE92-)
7 HE82- (HE92-)
6 HE83- (HE93-)
5 HE83- (HE93-)
4 HE84- (HE94-)
3 HE84- (HE94-)
2 HE85- (HE95-)
1 HE85- (HE95-)

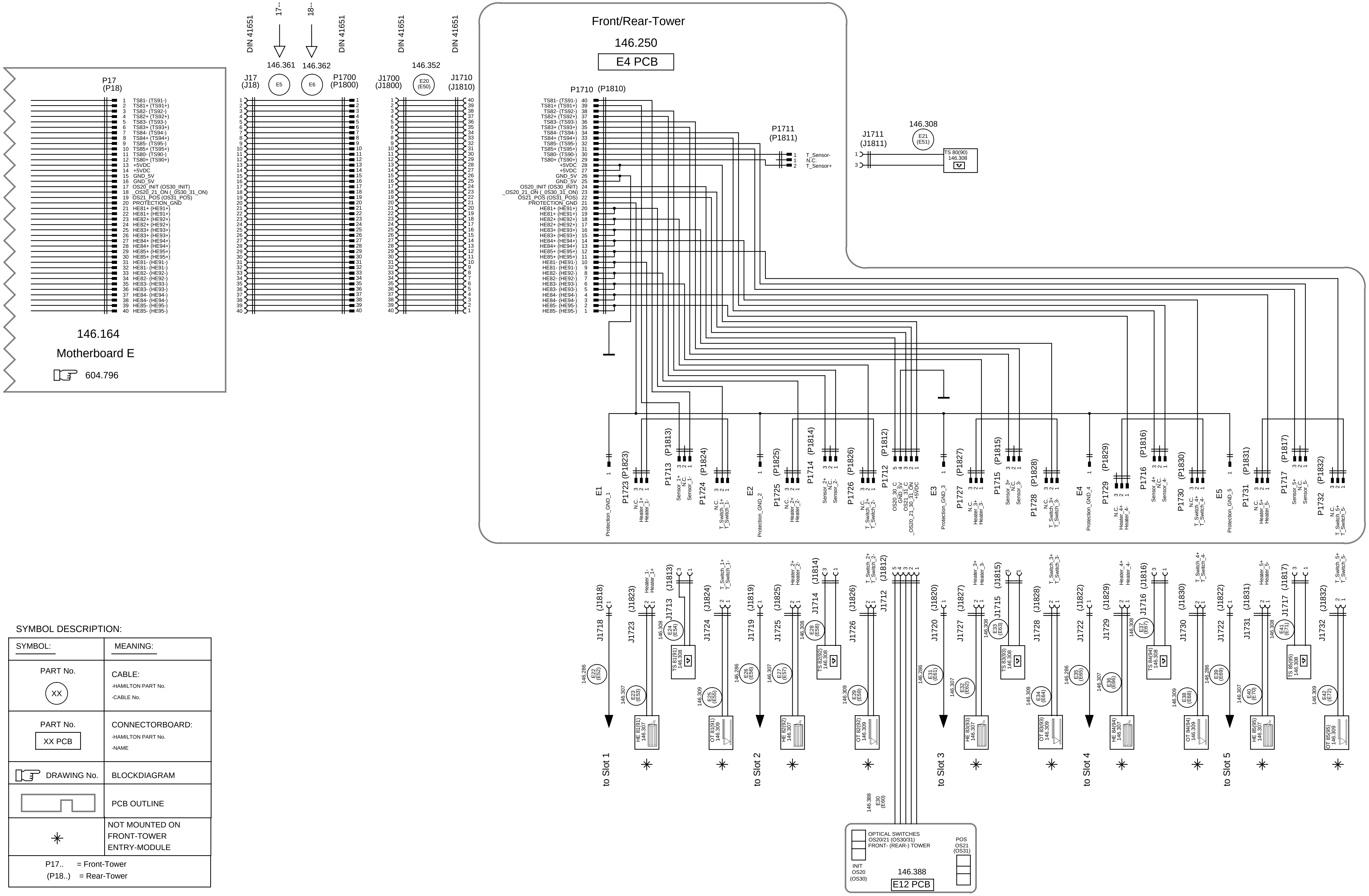
2.4.2.3 Wiring Diagram

Refer to the diagram following the 3D drawing:

- ❒ Wiring Diagram Front / Rear Tower: Dwg No. 616 004

Wiring Diagram Front / Rear - Tower

616.004 revision 00


P17 (P18)
146.164
Motherboard E
604.796
DIN 41651
17--
18--
146.361
146.362
E5
E6
J17 (J18)
P1700 (P1800)
J1700 (J1800)
146.352
E20 (E50)
J1710 (J1810)
Front/Rear-Tower
146.250
E4 PCB
P1710 (P1810)
P1711 (P1811)
T_Sensor-
N.C.
T_Sensor+
J1711 (J1811)
146.308
E21 (E51)
TS 80(90) 146.308
E1
E2
E3
E4
E5
Protection_GND_1
Protection_GND_2
Protection_GND_3
Protection_GND_4
Protection_GND_5
P1723 (P1823)
P1713 (P1813)
P1724 (P1824)
P1725 (P1825)
P1714 (P1814)
P1726 (P1826)
P1712 (P1812)
P1727 (P1827)
P1715 (P1815)
P1728 (P1828)
P1729 (P1829)
P1716 (P1816)
P1730 (P1830)
P1731 (P1831)
P1717 (P1817)
P1732 (P1832)
J1718 (J1818)
J1723 (J1823)
J1713 (J1813)
J1724 (J1824)
J1719 (J1819)
J1725 (J1825)
J1714 (J1814)
J1726 (J1826)
J1712 (J1812)
J1720 (J1820)
J1727 (J1827)
J1715 (J1815)
J1728 (J1828)
J1722 (J1822)
J1729 (J1829)
J1716 (J1816)
J1730 (J1830)
J1722 (J1822)
J1731 (J1831)
J1717 (J1817)
J1732 (J1832)
to Slot 1
to Slot 2
to Slot 3
to Slot 4
to Slot 5
HE 81(91) 146.307
OT 81(91) 146.309
HE 82(92) 146.307
OT 82(92) 146.309
HE 83(93) 146.307
OT 83(93) 146.309
HE 84(94) 146.307
OT 84(94) 146.309
HE 85(95) 146.307
OT 85(95) 146.309
TS 81(91) 146.308
TS 82(92) 146.308
TS 83(93) 146.308
TS 84(94) 146.308
TS 85(95) 146.308
146.388
E30 (E60)
OPTICAL SWITCHES OS20/21 (OS30/31) FRONT- (REAR-) TOWER
INIT OS20 (OS30)
POS OS21 (OS31)
146.388
E12 PCB

SYMBOL DESCRIPTION:

SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
☞ DRAWING No.	BLOCKDIAGRAM
⊓	PCB OUTLINE
✳	NOT MOUNTED ON FRONT-TOWER ENTRY-MODULE
P17.. = Front-Tower (P18..) = Rear-Tower	

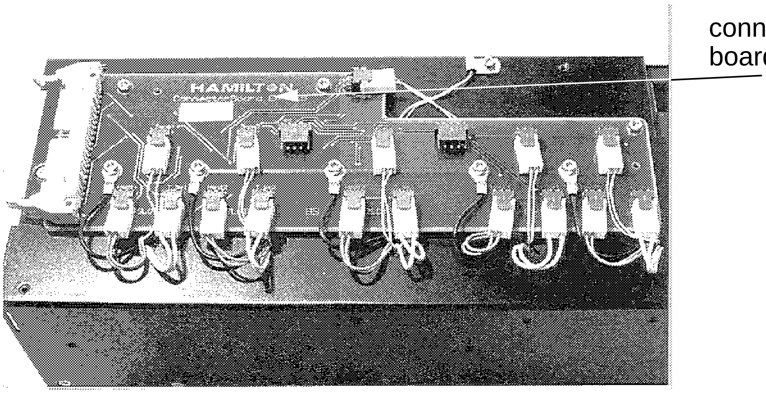
2.4.2.4 Replacing Spare Parts

NOTE

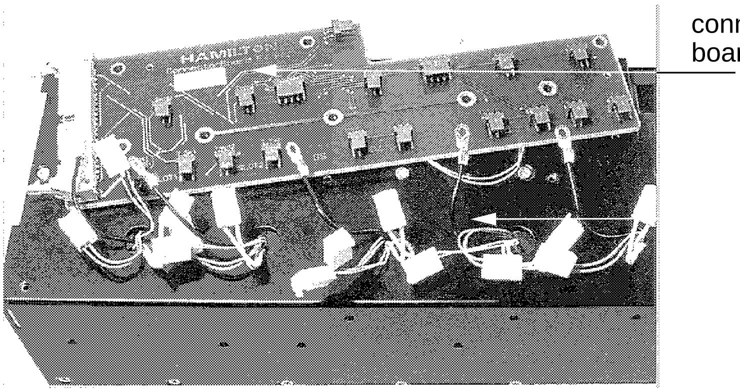
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

2.4.2.4.1 How to remove an incubation slot

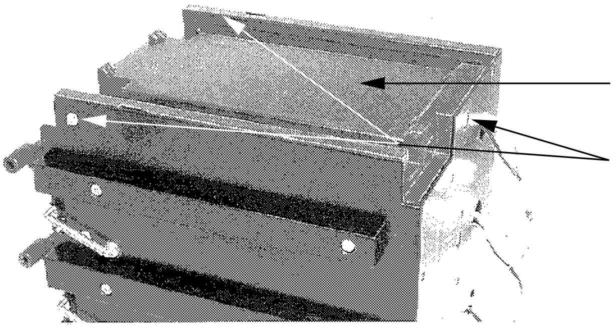
First remove the incubator tower from the entry or the incubator module (see section 2.1.6.2).


connector
board E4
HAMILTON

Unplug all connectors from connector board E4 and unscrew / remove connector board E4.


connector
board E4
HAMILTON

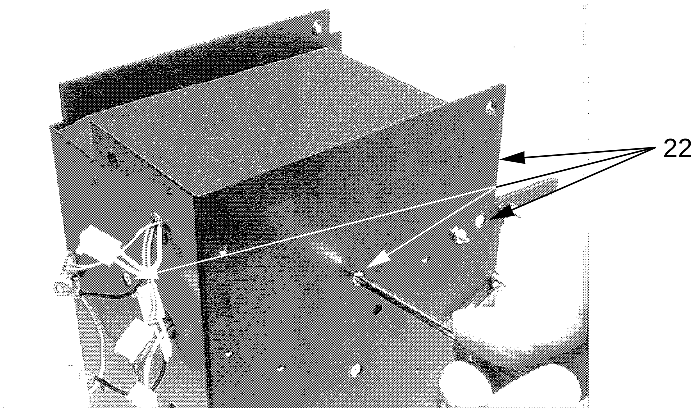
Unscrew and remove *tower top item 6* (3 screws).



Removal of slot 5:

Remove the two *tension springs item 21*.

Unscrew slot 5 (4 screws item 22).



Remove the slot door by bending tower housing out slightly.

Now remove slot 5. Carefully push the connectors one by one through the hole at the back of the housing.

To remove slots 1 through 4, all of the slots above must be removed first (e.g. to remove slot 2, first remove slots 5, 4, and 3). Follow the instructions given for slot 5.

Remounting:

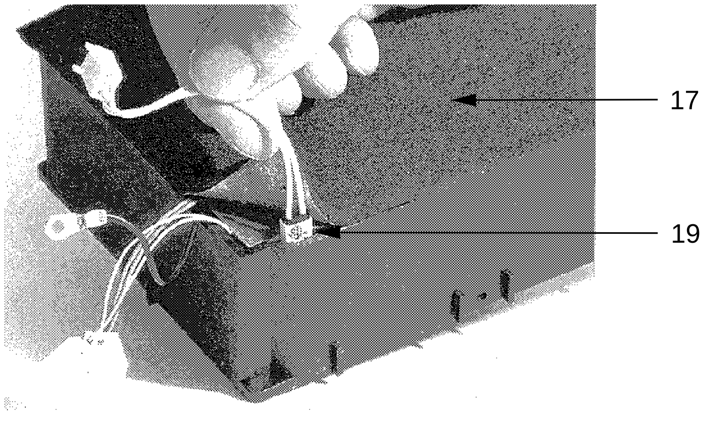
Max. tightening torque for countersink screws item 22:

60 Ncm (5.3 in. lbs.)

2.4.2.4.2 Over temperature switch item 19

Remove the corresponding slot (see section 2.4.2.4.1)

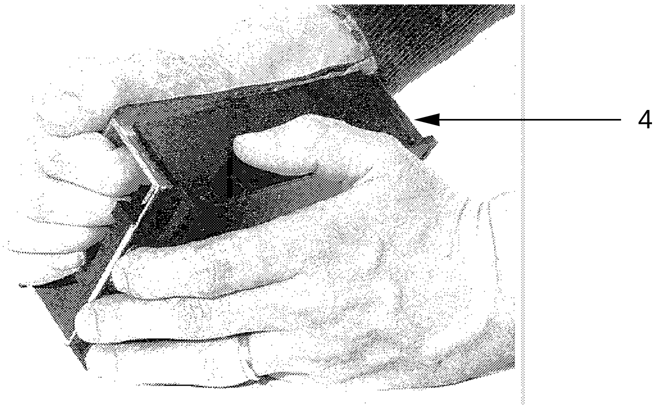
Detach the *chamber insulating mat item 17* in the corresponding corner and remove / replace the *over temperature switch item 19*.



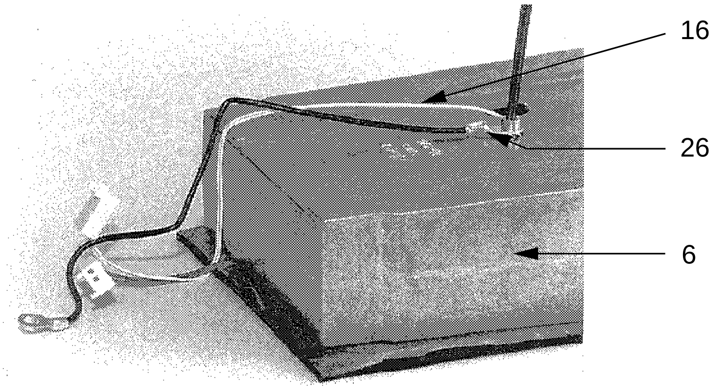
2.4.2.4.3 Cable E22 item 26, temperature sensor item 16

Remove the corresponding slot (see section 2.4.2.4.1)

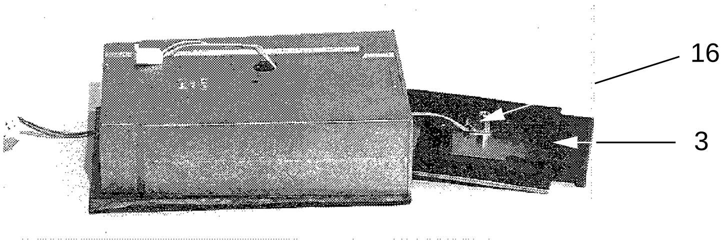
Remove *chamber item 1* from *chamber insulation item 4* (holding together with adhesive *chamber insulating mat item 1*7).



Unscrew *cable E22 item 26* (s*crew item 24*).

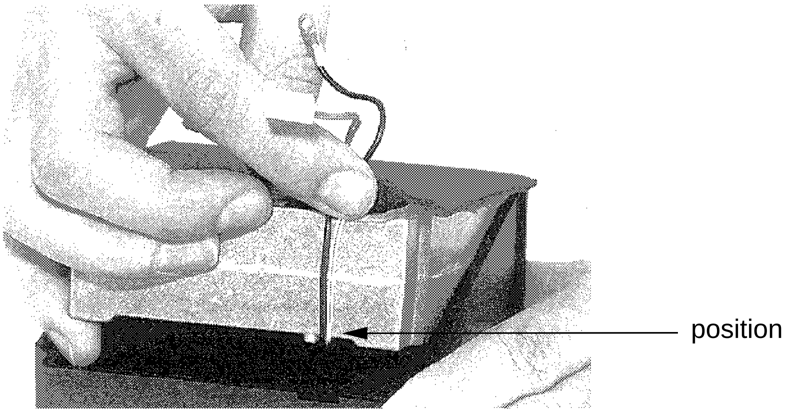


The *plate rest support item 3* can now be removed. Unscrew and replace the *temperature sensor item 16*.



Remounting:

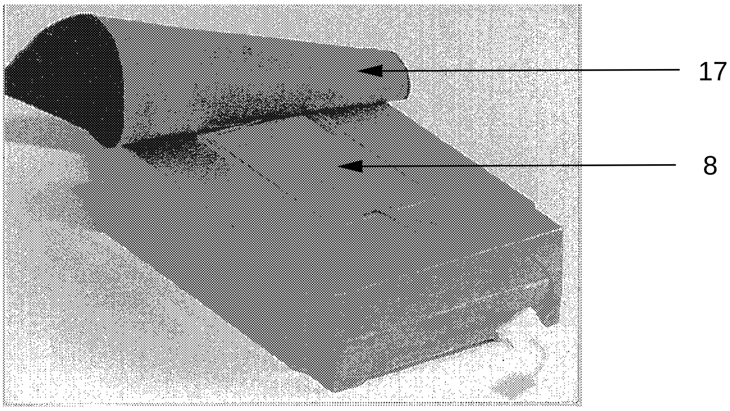
Position the two cables as shown in the following picture. Slightly stretch them prior to inserting the chamber into the chamber insulation. Make sure that no loops are formed and that cable is not pinched between the chamber and the chamber insulation.



2.4.2.4.4 Heating element item 8

Carefully peel off the c*hamber insulating mat item 17*.

Now peel off the *heating element item 8* and replace.



2.4.2.5 Spare Parts List

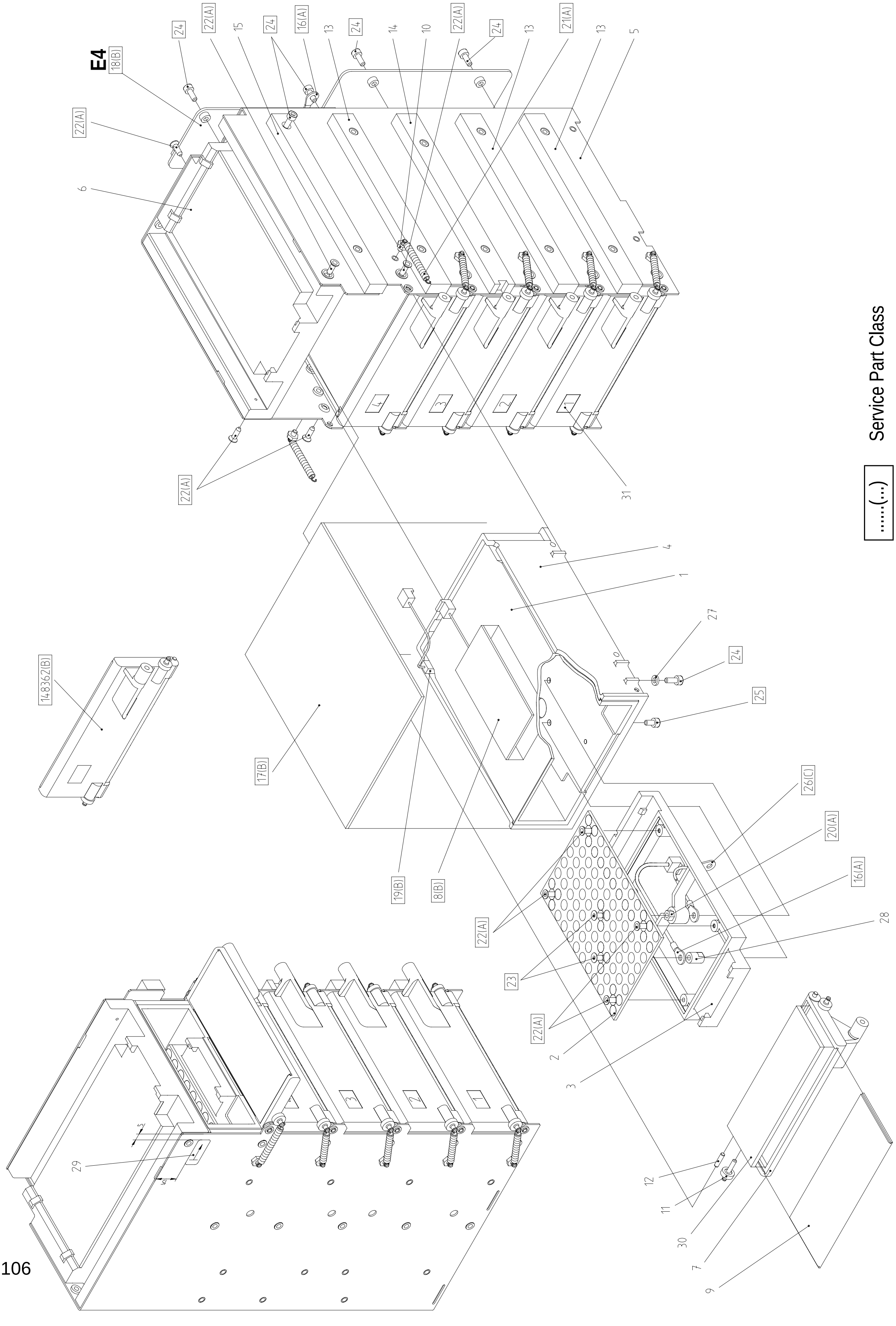
INCUBATOR TOWER CONTROLLED TEMP. 147466 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147467	KAMMERGEHAEUSE	00	1	5.000	
147468	AUFLAGEPLATTE	00	2	5.000	
147469	PLATTENPODEST	00	3	5.000	
147470	KAMMERISOLATION	00	4	5.000	
147471	TOWERGEHAEUSE	00	5	1.000	
147472	TOWERDECKPLATTE	00	6	1.000	
147473	KAMMERTUER	00	7	5.000	
146307	HEATING ELEMENT HE81	00	8	5.000	B
147474	TUERBLECH	00	9	5.000	
147475	FEDERHALTESCHRAUBE	00	10	10.000	
147476	FEDERHALTESTIFT	00	11	10.000	
279073	ZYL-STIFT 2,5X10 VSM12771B	00	12	10.000	
147478	FUEHRUNG 1	00	13	3.000	
147479	FUEHRUNG 2	01	14	1.000	
147480	FUEHRUNG 3	00	15	1.000	
146308	TEMPERATURE SENSOR TS70	00	16	6.000	A
147477	KAMMERISOLIERMATTE	00	17	5.000	B
146250	CONNECTORBOARD E4 PCB	00	18	1.000	B
146309	OVER TEMPERATURE SWITCH OT81	00	19	5.000	B
257036	DISTANZHALTER M3 X 8 I/I GEW.	00	20	5.000	A
256116	ZUGFEDER D 0.50 DM 3.0 LO 24.5	00	21	10.000	A
420214	PT-SENKKOPFSCHRAUBE KA 30 X 8	00	22	43.000	A
403452	SENKSCHRAUBE M 3X 6 DIN7991	00	23	10.000	
400263	ZYL-SCHR.M 3X 8 DIN912 A2	00	24	14.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	25	15.000	
146286	CABLE E22	00	26	5.000	C
411001	FCHERSCHEIBE M3 DIN6798	00	27	5.000	
148243	VERBINDUNGSBOLZEN	00	28	5.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	29	1.000	
147995	TUERISOLATION	00	30	5.000	
255039	TUERBESCHRIFTUNG	00	31	1.000	

Service Assemblies (parts list 146999)

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
148362	INCUBATOR DOOR	00		1	B

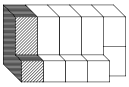
2.4.3 3D Drawing Incubator Tower Controlled: 147 466 revision 02

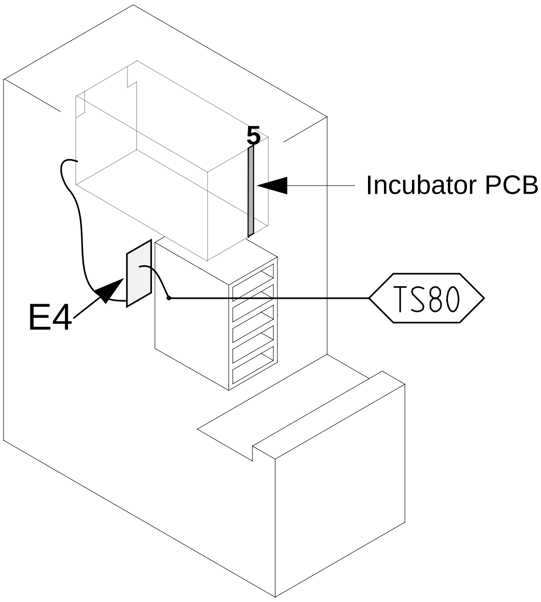

E4
18(B)
22(A)
6
24
22(A)
15
24
16(A)
13
24
14
10
22(A)
24
13
21(A)
13
5
22(A)
31
148362(B)
17(B)
4
1
27
24
25
26(C)
20(A)
16(A)
28
19(B)
8(B)
22(A)
23
22(A)
2
3
29
12
11
30
7
9
1
2
3
4

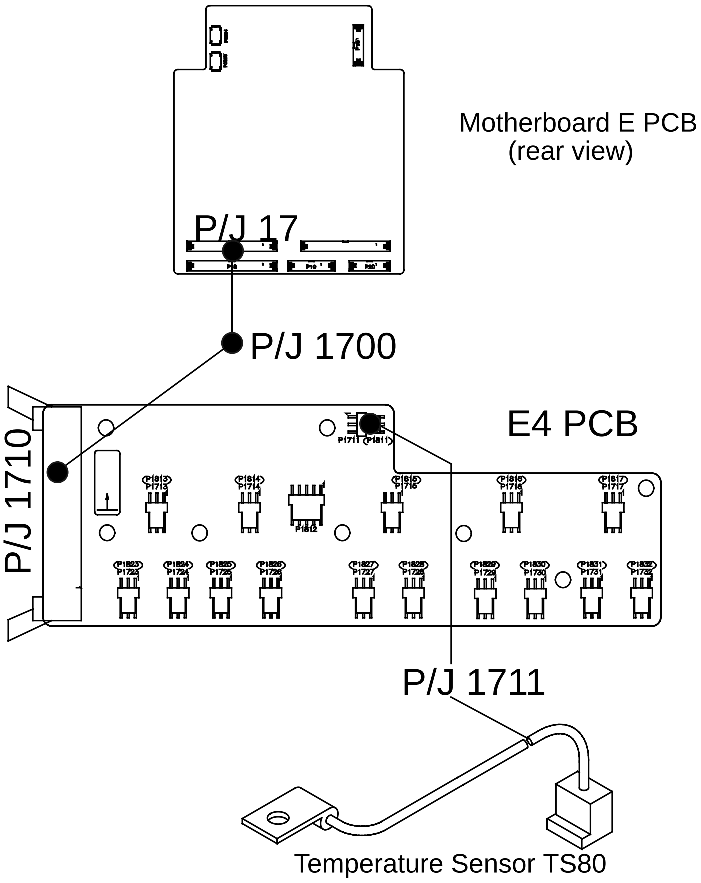
......(...) Service Part Class

2.4.4 Troubleshooting

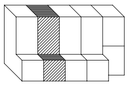
Module:	Entry
Assembly:	Fan Control **(Front Tower)**
Sensor:	Temperature Sensor TS80
Boards:	E4, Incubator PCB Motherboard E
Error Message:	

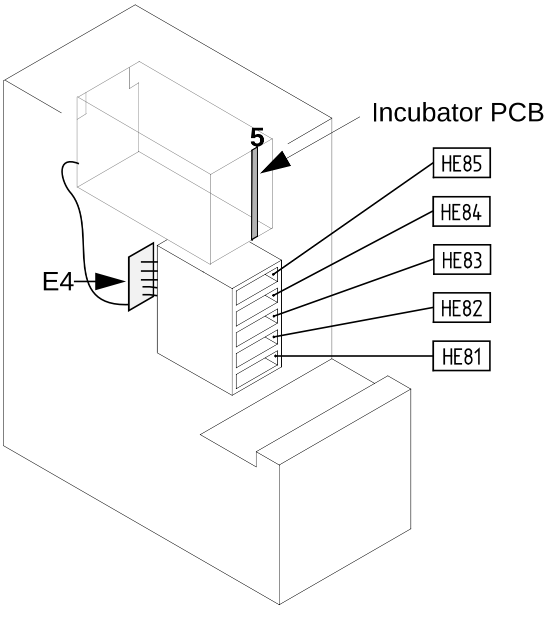


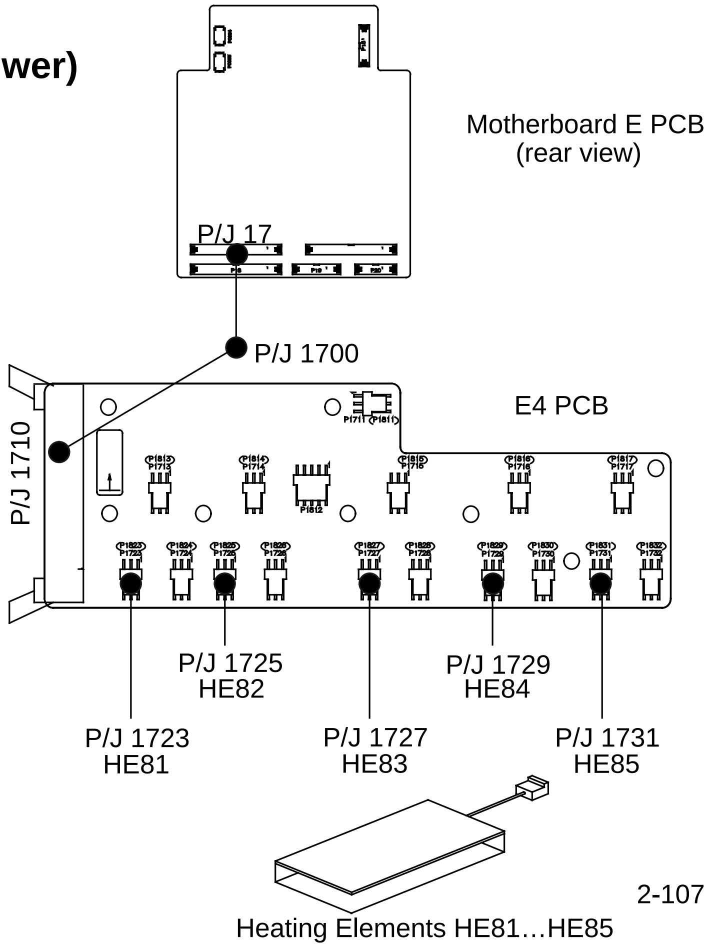

5
Incubator PCB
E4
TS80


Motherboard E PCB
(rear view)
P/J 17
P/J 1700
E4 PCB
P/J 1710
P/J 1711
Temperature Sensor TS80

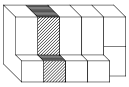
Module:	Incubator
Assembly:	Inc. Tower Controlled **(Front Tower)**
Actors:	Heating Elements HE81…HE85
Boards:	E4, Incubator PCB Motherboard E
Error Message:	

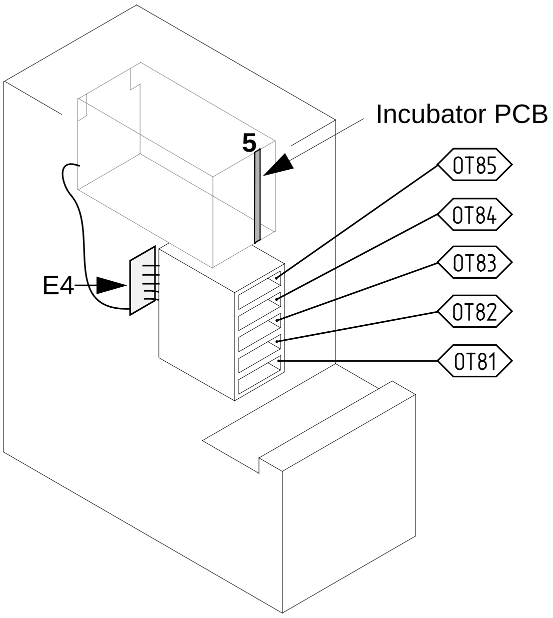


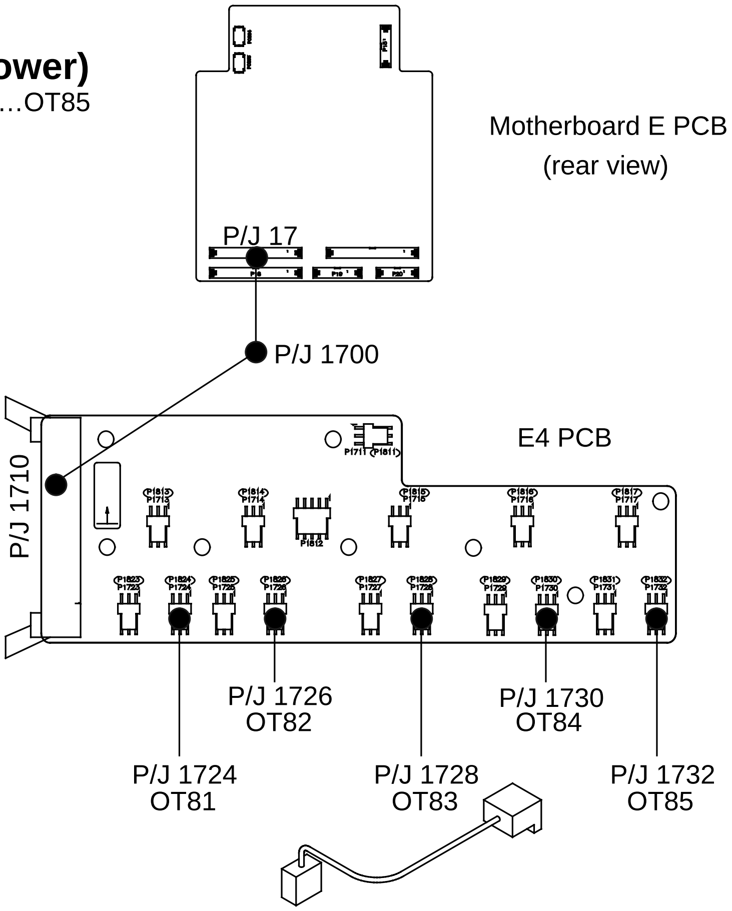

Incubator PCB
5
E4
HE85
HE84
HE83
HE82
HE81


Motherboard E PCB
(rear view)
P/J 17
P/J 1700
E4 PCB
P/J 1710
P/J 1725
HE82
P/J 1729
HE84
P/J 1723
HE81
P/J 1727
HE83
P/J 1731
HE85
Heating Elements HE81…HE85

Module: Incubator
Assembly: Inc. Tower Controlled **(Front Tower)**
Sensors: Over Temperature Switches OT81…OT85
Boards: E4, Incubator PCB
Motherboard E
Error Message:

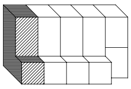


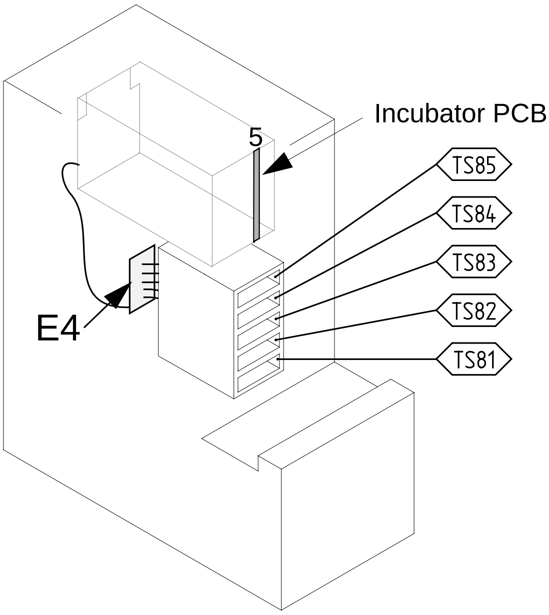

Incubator PCB
5
E4
OT85
OT84
OT83
OT82
OT81

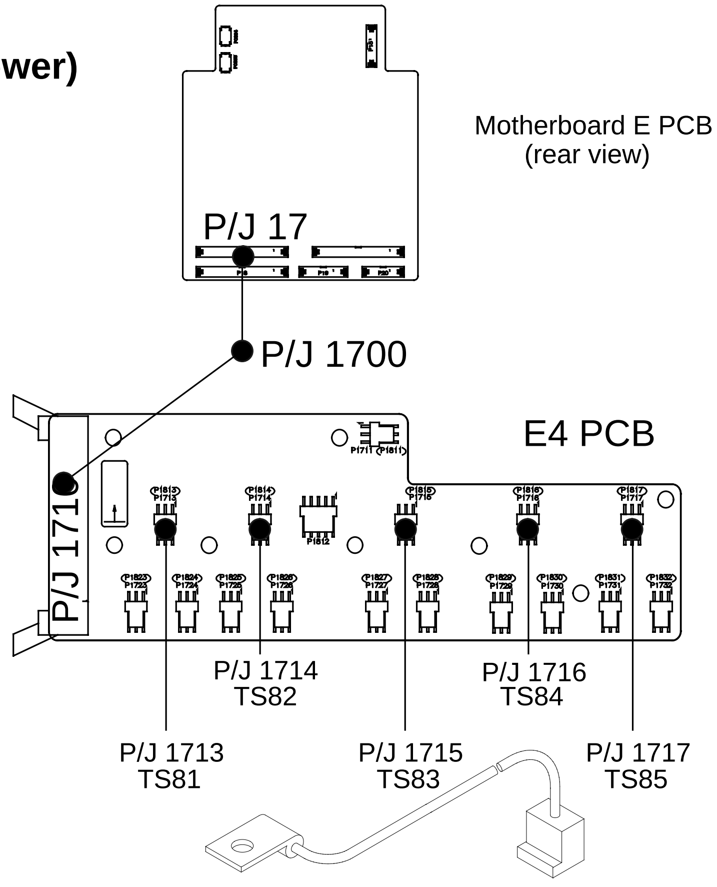

Motherboard E PCB
(rear view)
P/J 17
P/J 1700
E4 PCB
P/J 1710
P/J 1726
OT82
P/J 1730
OT84
P/J 1724
OT81
P/J 1728
OT83
P/J 1732
OT85

Over Temperature Switches OT81…OT85

Module: Entry
Assembly: Inc. Tower Controlled **(Front Tower)**
Sensors: Temperature Sensors TS81…TS85
Boards: E4, Incubator PCB
Motherboard E
Error Message:

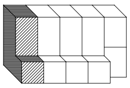


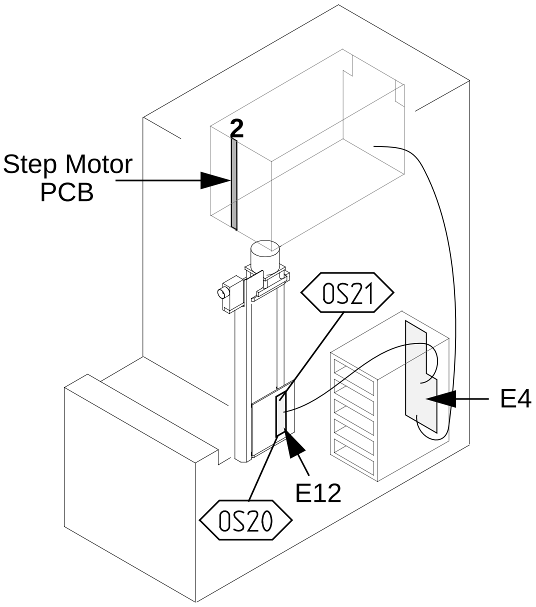

Incubator PCB
5
E4
TS85
TS84
TS83
TS82
TS81

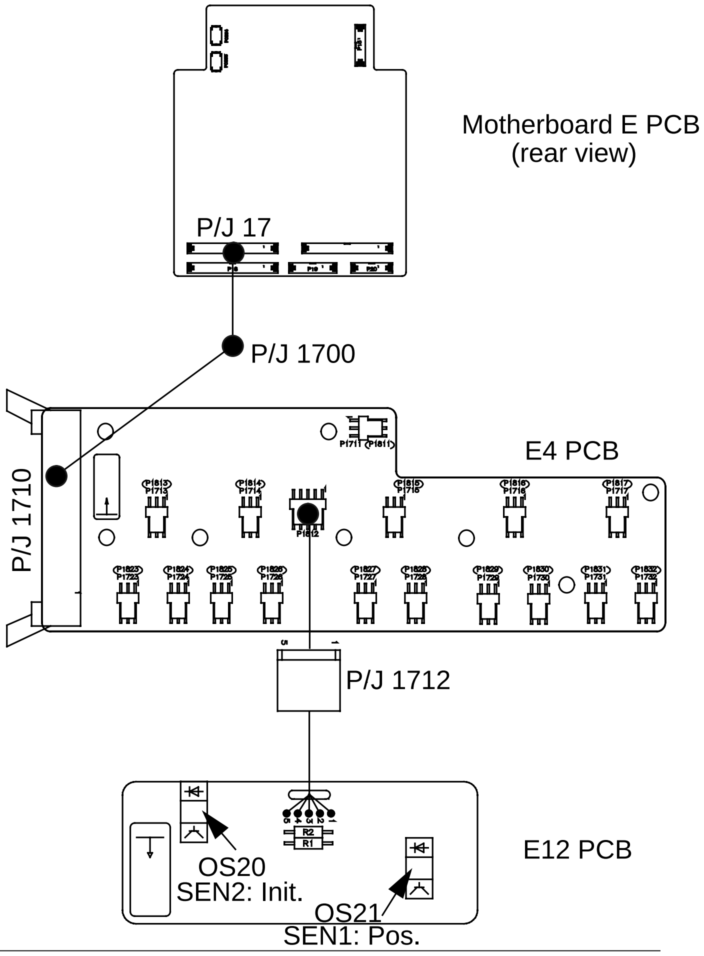

Motherboard E PCB
(rear view)
P/J 17
P/J 1700
E4 PCB
P/J 1710
P/J 1714
TS82
P/J 1716
TS84
P/J 1713
TS81
P/J 1715
TS83
P/J 1717
TS85

Temperature Sensors TS81…TS85

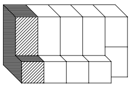
Module: Entry
Assembly: Incubator Tower Lift
Sensor: Optical Switch OS20 / OS21
Boards: E4, E12, Step Motor PCB
Motherboard E
Error Message:

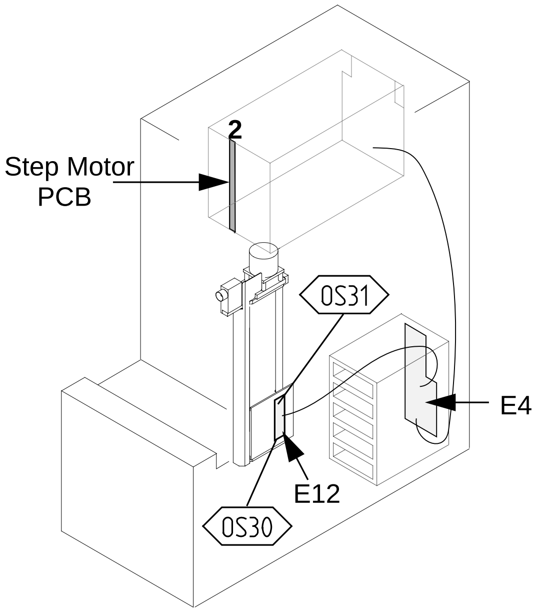


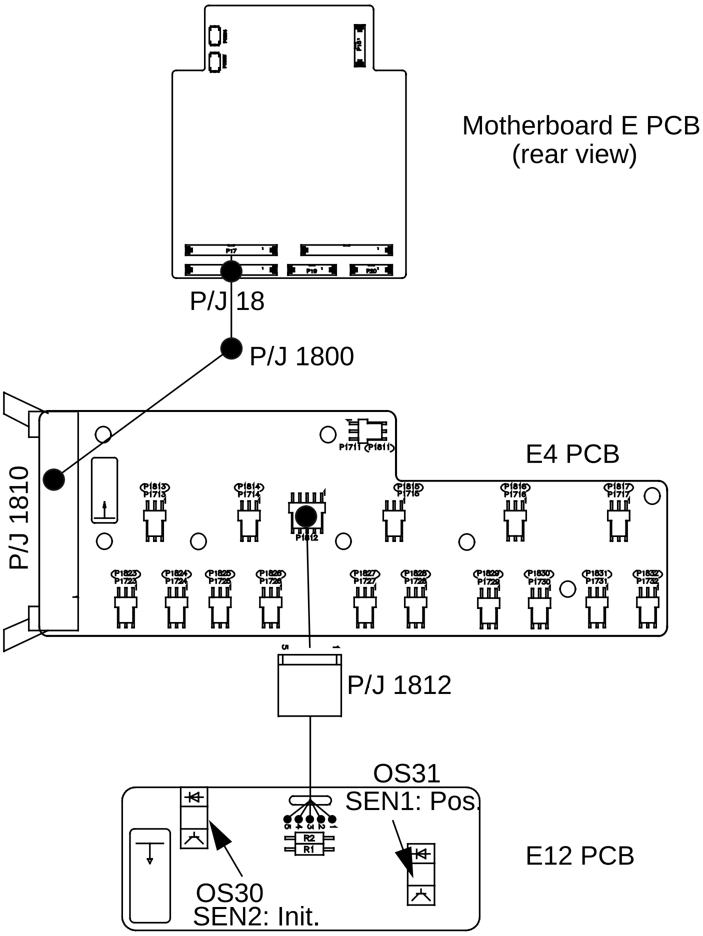

2
Step Motor
PCB
OS21
E4
E12
OS20


Motherboard E PCB
(rear view)
P/J 17
P/J 1700
P/J 1710
E4 PCB
P/J 1712
E12 PCB
OS20
SEN2: Init.
OS21
SEN1: Pos.

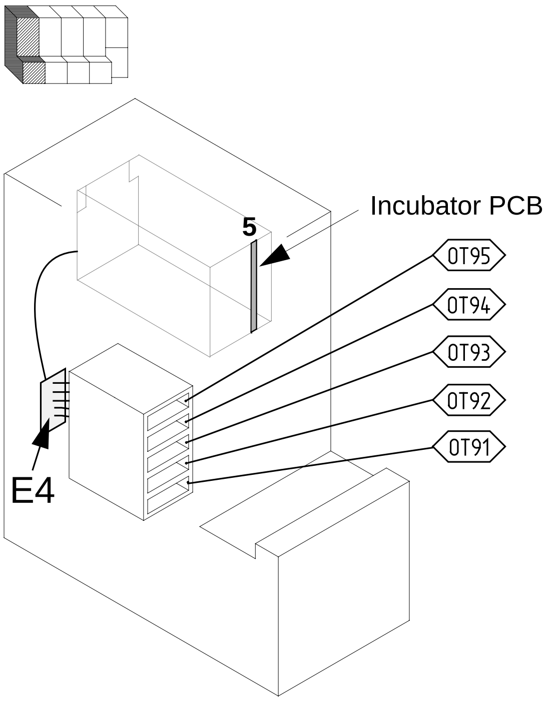
Module: Entry
Assembly: Incubator Tower Lift (Rear)
Sensor: Optical Switch OS30 / OS31
Boards: E4, E12, Step Motor PCB
Motherboard E
Error Message:

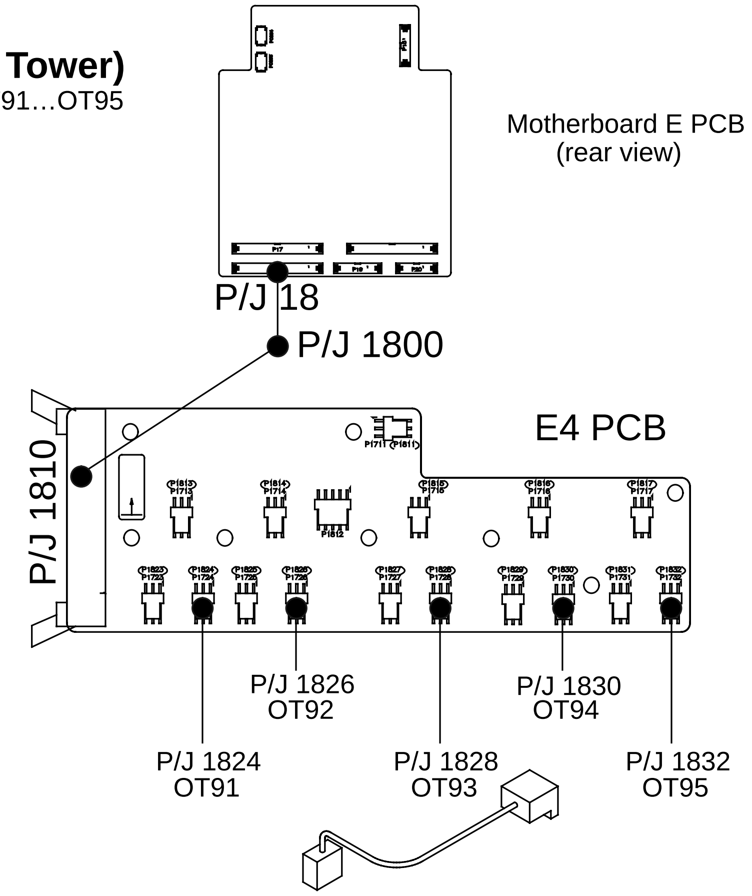



2
Step Motor
PCB
OS31
E4
E12
OS30


Motherboard E PCB
(rear view)
P/J 18
P/J 1800
P/J 1810
E4 PCB
P/J 1812
OS31
SEN1: Pos.
E12 PCB
OS30
SEN2: Init.

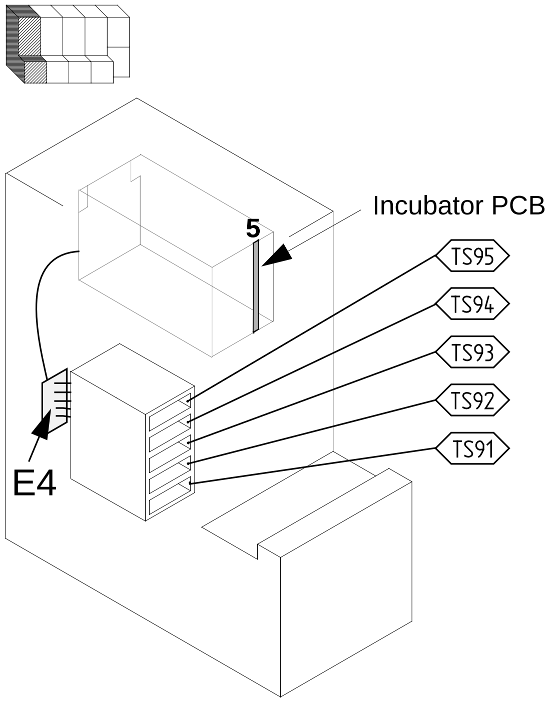
Module: Entry
Assembly: Inc. Tower Controlled **(Rear Tower)**
Sensors: Over Temperature Switches OT91…OT95
Boards: E4, Incubator PCB
Motherboard E
Error Message:

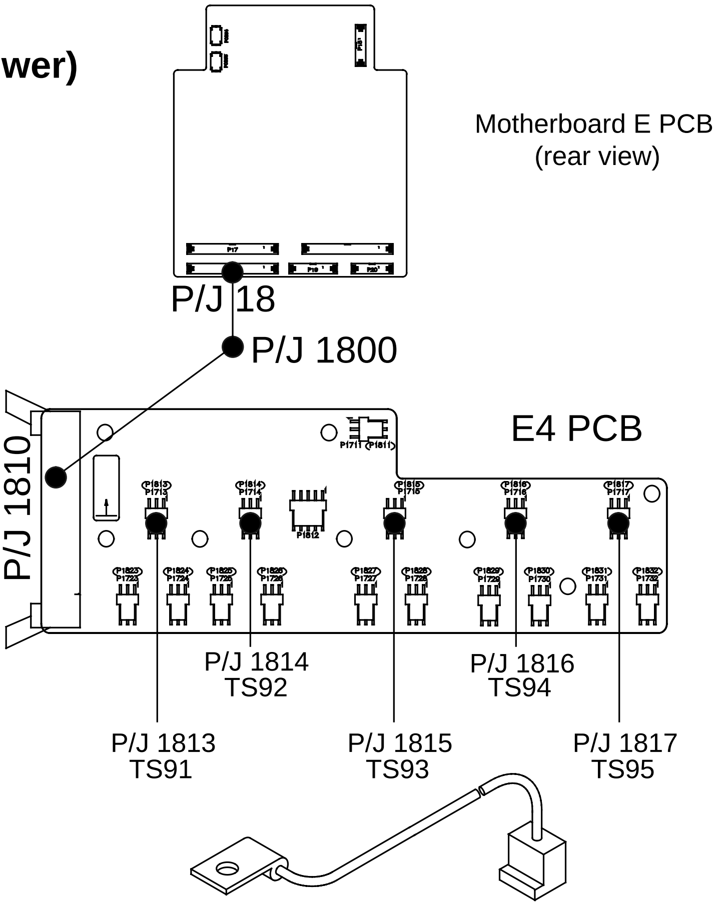

Incubator PCB
5
OT95
OT94
OT93
OT92
OT91
E4


Motherboard E PCB
(rear view)
P/J 18
P/J 1800
P/J 1810
E4 PCB
P/J 1826
OT92
P/J 1830
OT94
P/J 1824
OT91
P/J 1828
OT93
P/J 1832
OT95

Over Temperature Switches OT91…OT95

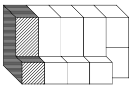
Module: Entry
Assembly: Inc. Tower Controlled **(Rear Tower)**
Sensors: Temperature Sensors TS91…TS95
Boards: E4, Incubator PCB
Motherboard E
Error Message:

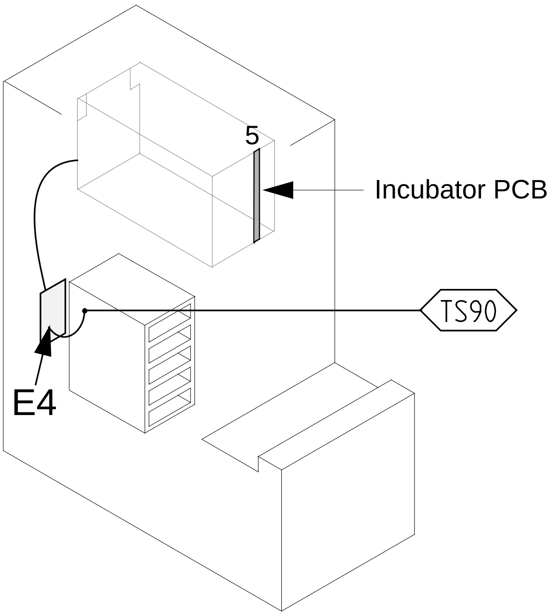

Incubator PCB
5
TS95
TS94
TS93
TS92
TS91
E4

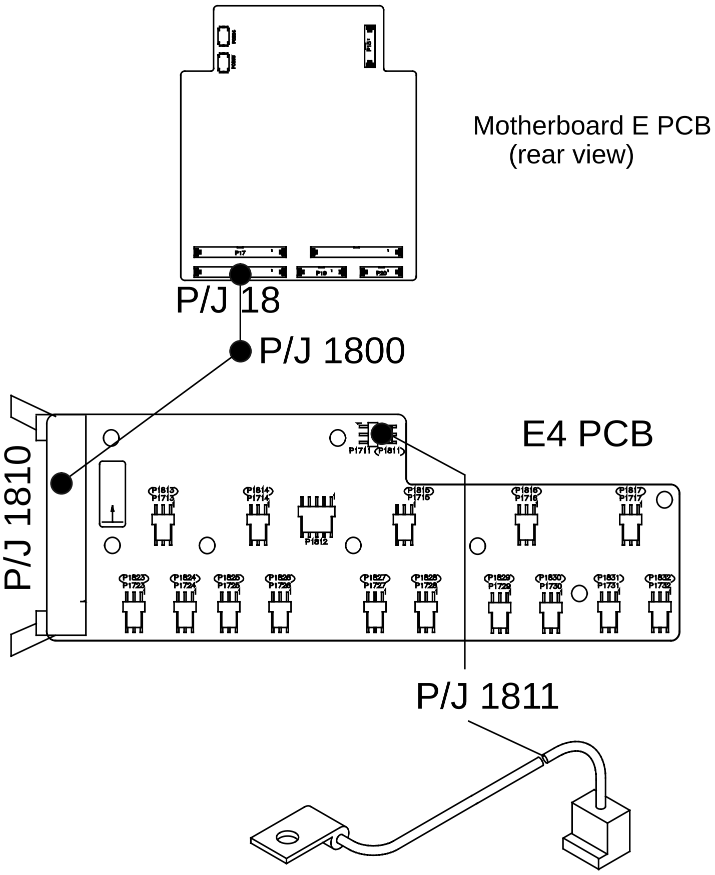

Motherboard E PCB
(rear view)
P/J 18
P/J 1800
P/J 1810
E4 PCB
P/J 1814
TS92
P/J 1816
TS94
P/J 1813
TS91
P/J 1815
TS93
P/J 1817
TS95

Temperature Sensors TS91…TS95

Module: Entry
Assembly: Fan Control **(Rear Tower)**
Sensor: Temperature Sensor TS90
Boards: E4, Incubator PCB
Motherboard E
Error Message:

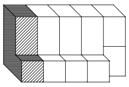


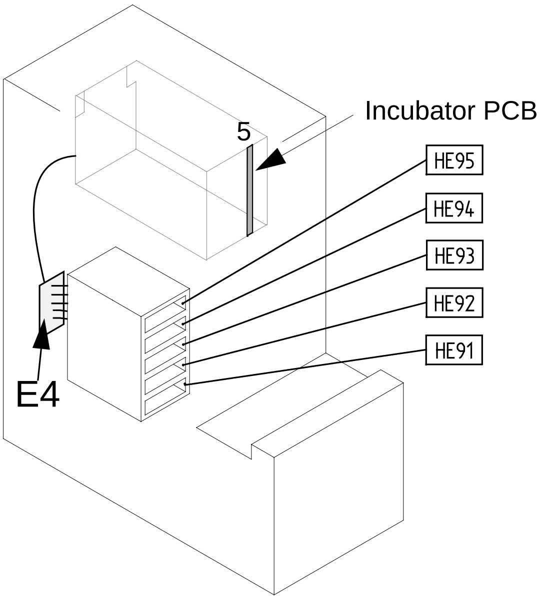

5
Incubator PCB
TS90
E4

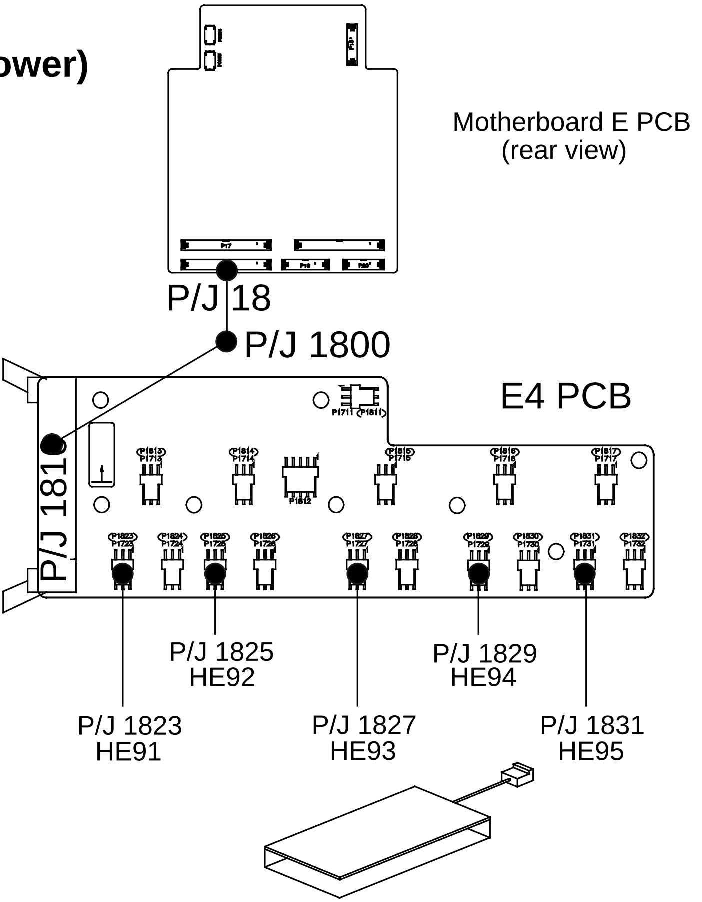

Motherboard E PCB
(rear view)
P/J 18
P/J 1800
E4 PCB
P/J 1810
P/J 1811

Temperature Sensor TS90

Module: Entry
Assembly: Inc. Tower Controlled **(Rear Tower)**
Actors: Heating Elements HE91…HE95
Boards: E4, Incubator PCB
Motherboard E
Error Message:




Incubator PCB
5
HE95
HE94
HE93
HE92
HE91
E4

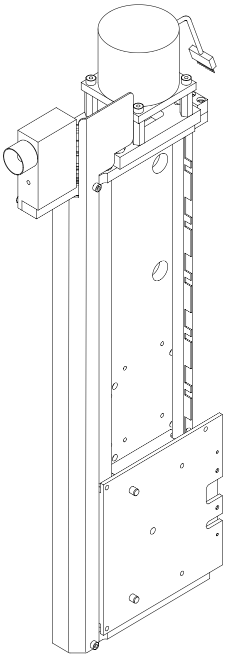

Motherboard E PCB
(rear view)
P/J 18
P/J 1800
E4 PCB
P/J 1810
P/J 1825
HE92
P/J 1829
HE94
P/J 1823
HE91
P/J 1827
HE93
P/J 1831
HE95

Heating Elements HE91…HE95

Incubator Tower Lift

147 293

- Functional Description
- Connector Board
  E 12 146 388
- Wiring Diagram
- Replacing Spare Parts
- Spare Parts List
- 3D Drawing
- Troubleshooting



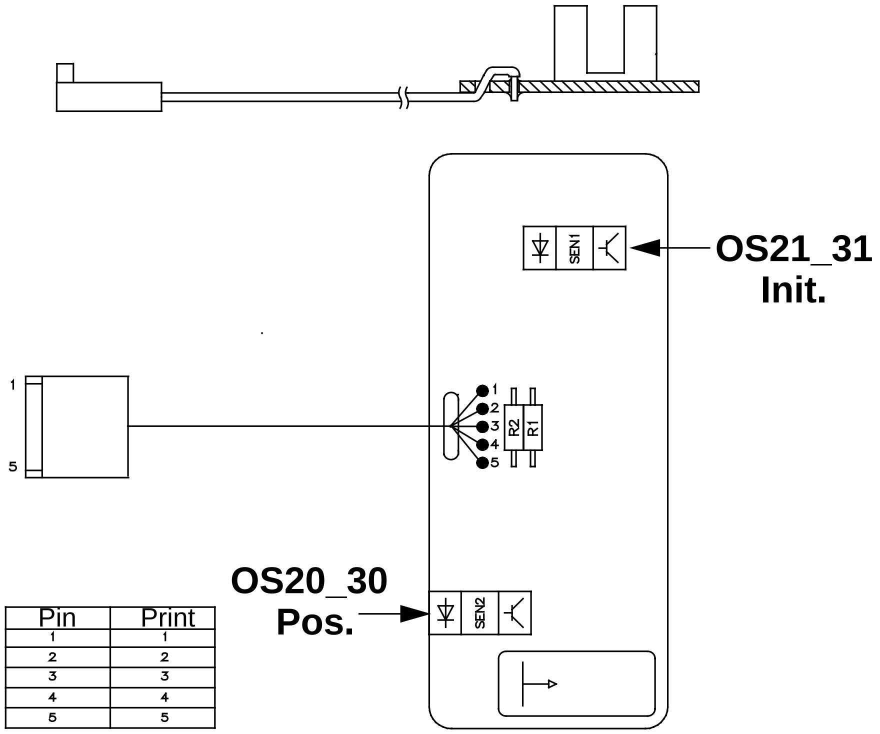
2.5 Incubator Tower Lift 147 293

2.5.1 Functional Description

Each incubator tower is raised or lowered by an Incubator Tower Lift.

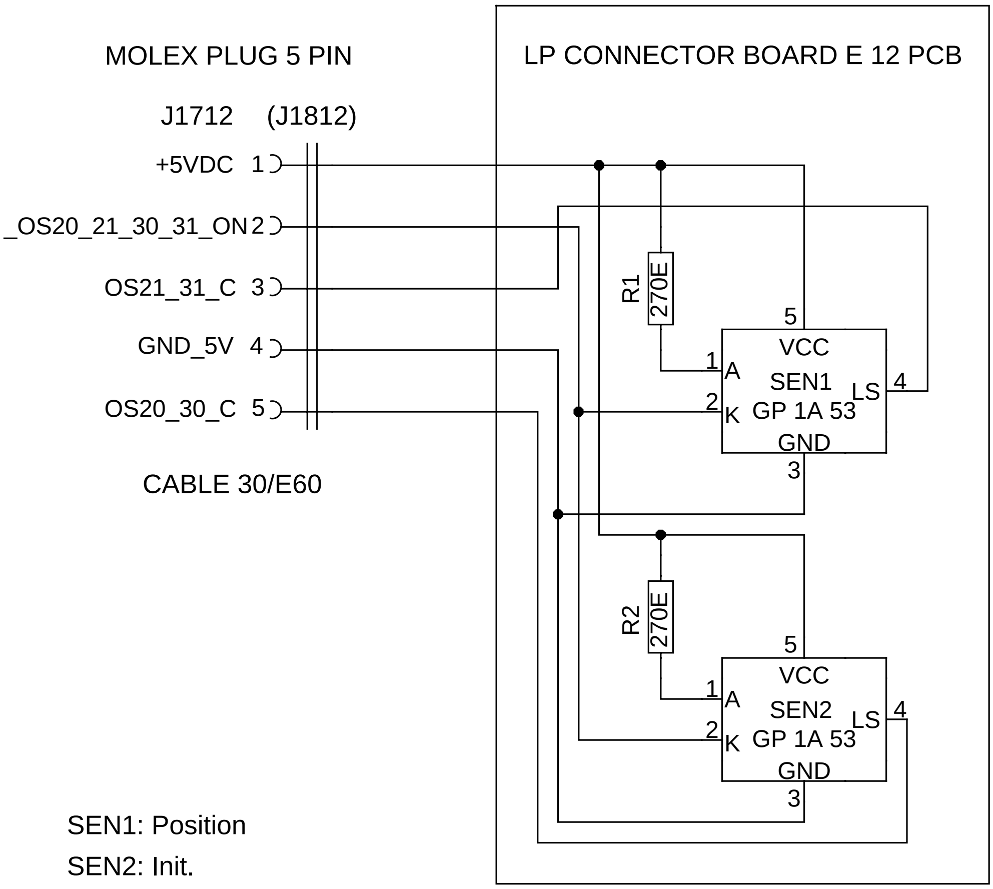
2.5.2 Connector Boards

Connector Board E12 PCB Component Layout 146.388 revision 00


OS21_31
Init.
SEN1
1
5
1
2
3
4
5
R2
R1
OS20_30
Pos.
SEN2

Pin	Print
1	1
2	2
3	3
4	4
5	5

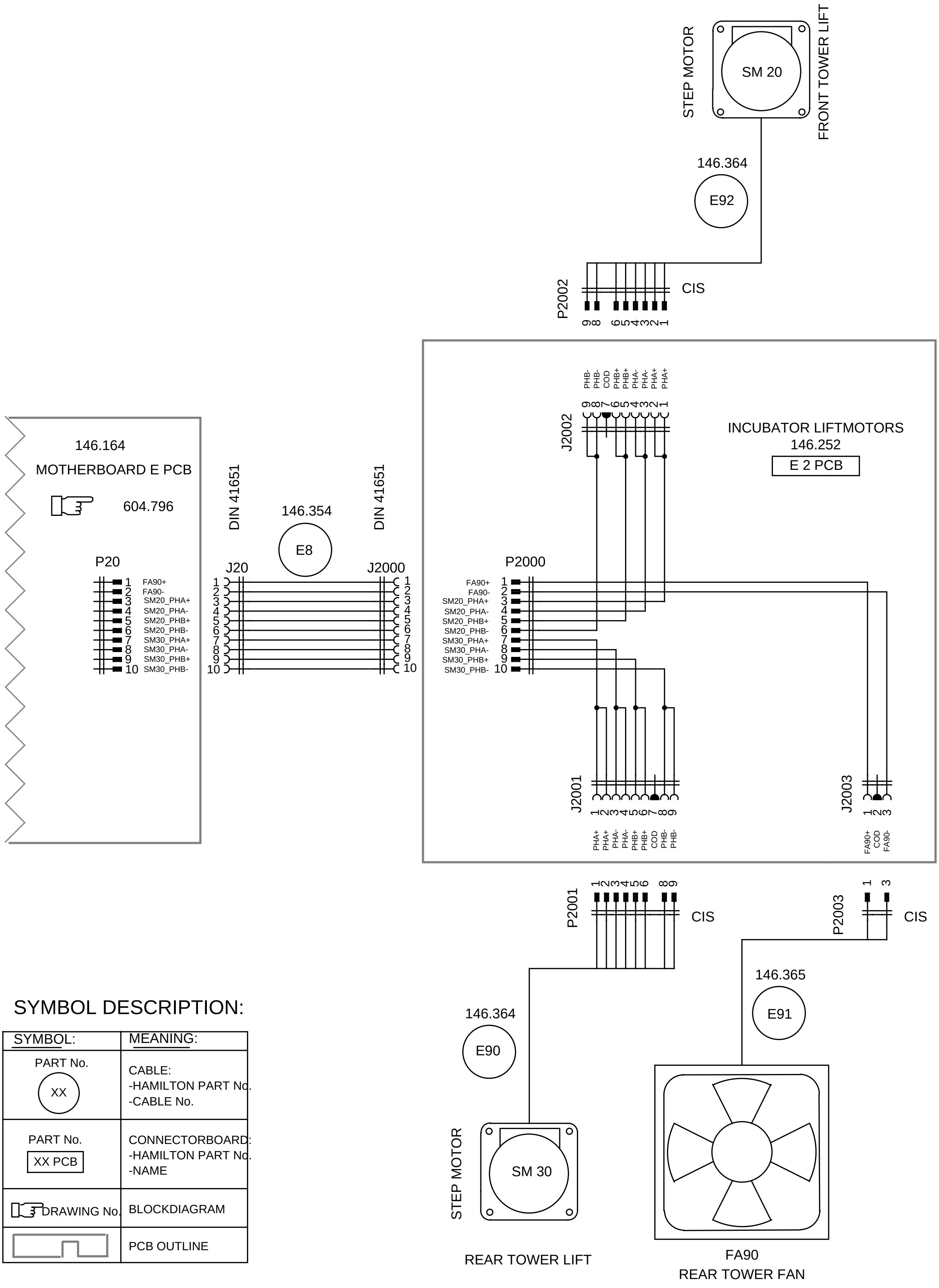
Connector Board E12 PCB OS20/21 OS30/31 604.850 revision 00


MOLEX PLUG 5 PIN
J1712 (J1812)
+5VDC 1
_OS20_21_30_31_ON 2
OS21_31_C 3
GND_5V 4
OS20_30_C 5
CABLE 30/E60
LP CONNECTOR BOARD E 12 PCB
R1
270E
5
VCC
1
A
SEN1
LS
4
2
K
GP 1A 53
GND
3
R2
270E
5
VCC
1
A
SEN2
LS
4
2
K
GP 1A 53
GND
3

SEN1: Position
SEN2: Init.

2.5.3 Wiring Diagram

Incubator Tower Lift: 616 003 revision 00


STEP MOTOR
SM 20
FRONT TOWER LIFT
146.364
E92
P2002
CIS
9 8 6 5 4 3 2 1
146.164
MOTHERBOARD E PCB
604.796
P20
1 FA90+
2 FA90-
3 SM20_PHA+
4 SM20_PHA-
5 SM20_PHB+
6 SM20_PHB-
7 SM30_PHA+
8 SM30_PHA-
9 SM30_PHB+
10 SM30_PHB-
DIN 41651
146.354
E8
DIN 41651
J20
J2000
1 2 3 4 5 6 7 8 9 10
PHB- PHB- COD PHB+ PHB+ PHA- PHA- PHA+ PHA+
9 8 7 6 5 4 3 2 1
J2002
INCUBATOR LIFTMOTORS
146.252
E 2 PCB
P2000
FA90+ 1
FA90- 2
SM20_PHA+ 3
SM20_PHA- 4
SM20_PHB+ 5
SM20_PHB- 6
SM30_PHA+ 7
SM30_PHA- 8
SM30_PHB+ 9
SM30_PHB- 10
J2001
1 2 3 4 5 6 7 8 9
PHA+ PHA+ PHA- PHA- PHB+ PHB+ COD PHB- PHB-
J2003
1 2 3
FA90+ COD FA90-
P2001
1 2 3 4 5 6 8 9
CIS
P2003
1 3
CIS
146.365
E91
146.364
E90
STEP MOTOR
SM 30
REAR TOWER LIFT
FA90
REAR TOWER FAN

SYMBOL DESCRIPTION:

SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
☞ DRAWING No.	BLOCKDIAGRAM
	PCB OUTLINE

2.5.4 Replacing Spare Parts

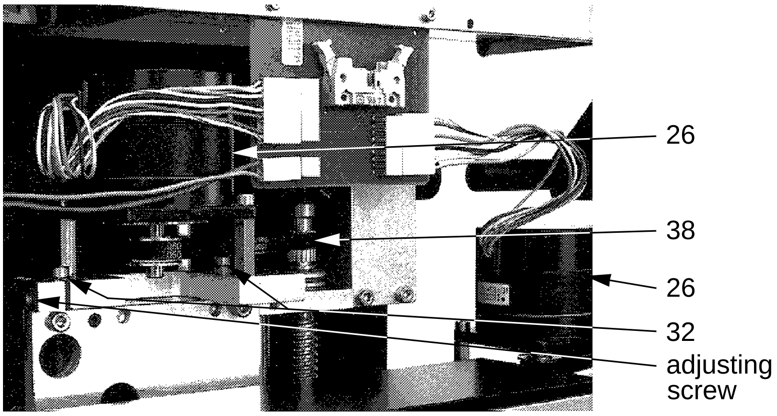
NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

2.5.4.1 Stepper motor E SM20 item 26 and / or gear belt item 38

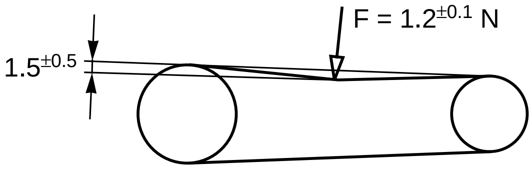
Remove *hood item 97* (see section 2.1.6).

Unscrew *stepper motor item 26* (3 screws) and replace.

For replacing / slackening / tensioning the belt, loosen the two *screws item 32*, then tighten / slacken the belt by turning the adjusting screw.



Belt tension:

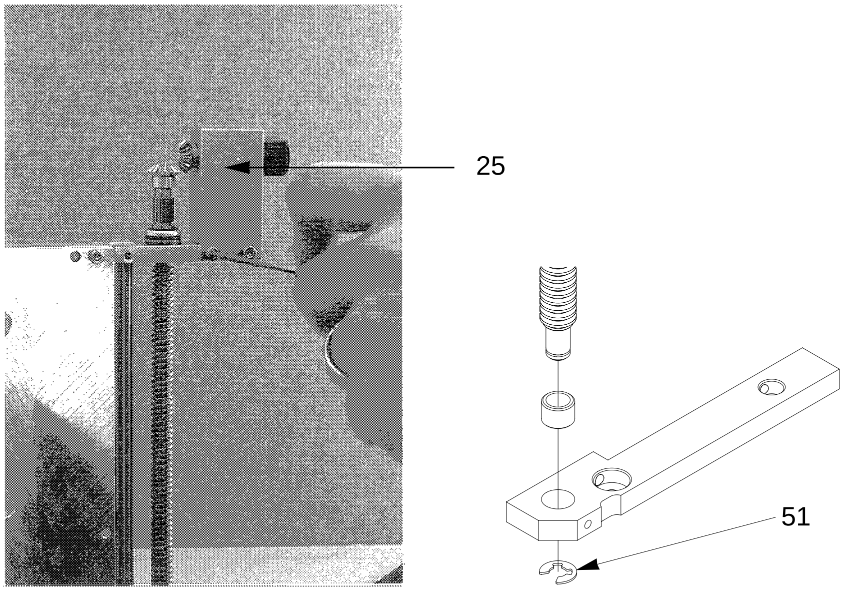


2.5.4.2 Thrust bearing item 43, thrust washer item 45

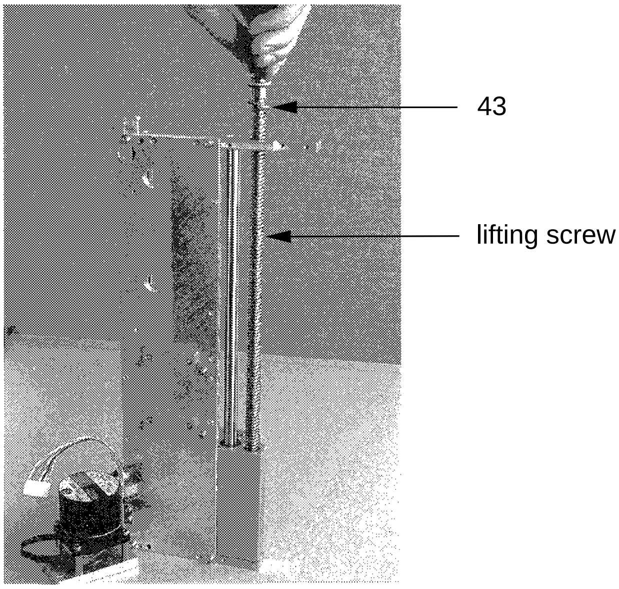
Remove Incubator tower lift (see section 2.1.6.2).

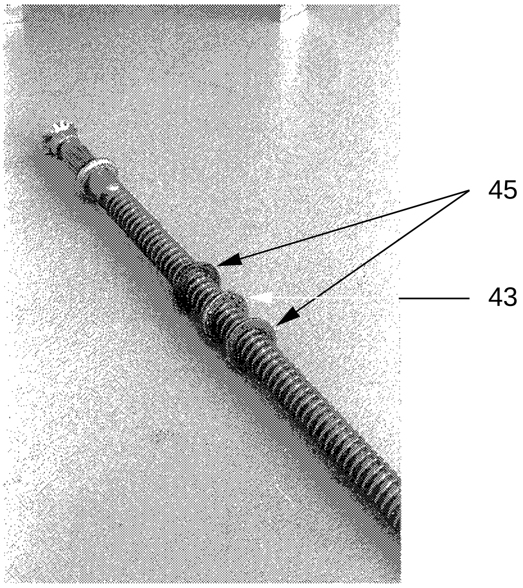
Remove *motor support item 3* with motor (see section 2.5.4.1).

Remove *gear support item 25* and *retaining ring item 51*.



Now turn *lifting screw item 11* counter-clockwise until it becomes free from *tower lift support item 7*.





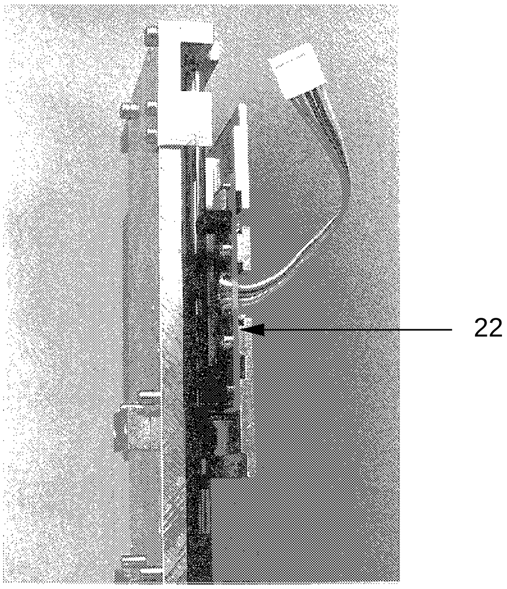
Carefully pull the lifting screw off and replace thrust bearing item 43 and/ or thrust washer item 45.

2.5.4.3 Connector board E12 item 22

Remove the corresponding inc. tower lift (see section 2.1.6.2)

Drive the tower lift support up or down so that the flags are not between the optical switches.

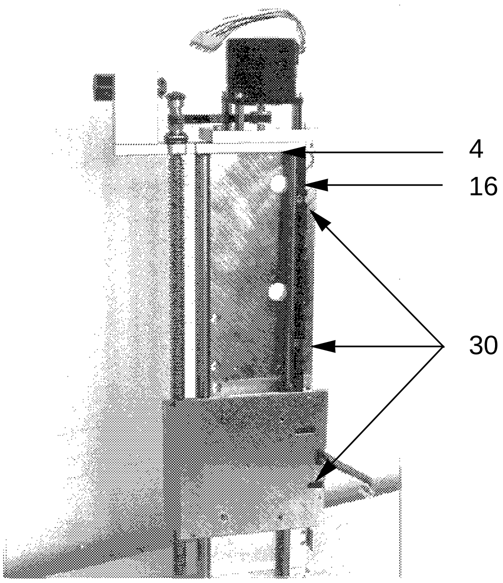
Unscrew connector board E12 item 22 and lift it carefully off of the two positioning pins.



2.5.4.4 Flag item 16

Remove the corresponding incubator tower lift (see section 2.1.6.2)

Unscrew the *flag item 16* (3 screws item 30). Drive the tower lift support up or down to gain access to the third screw.



When remounting, the upper end of the flag must butt against the *top guide plate item 4*.

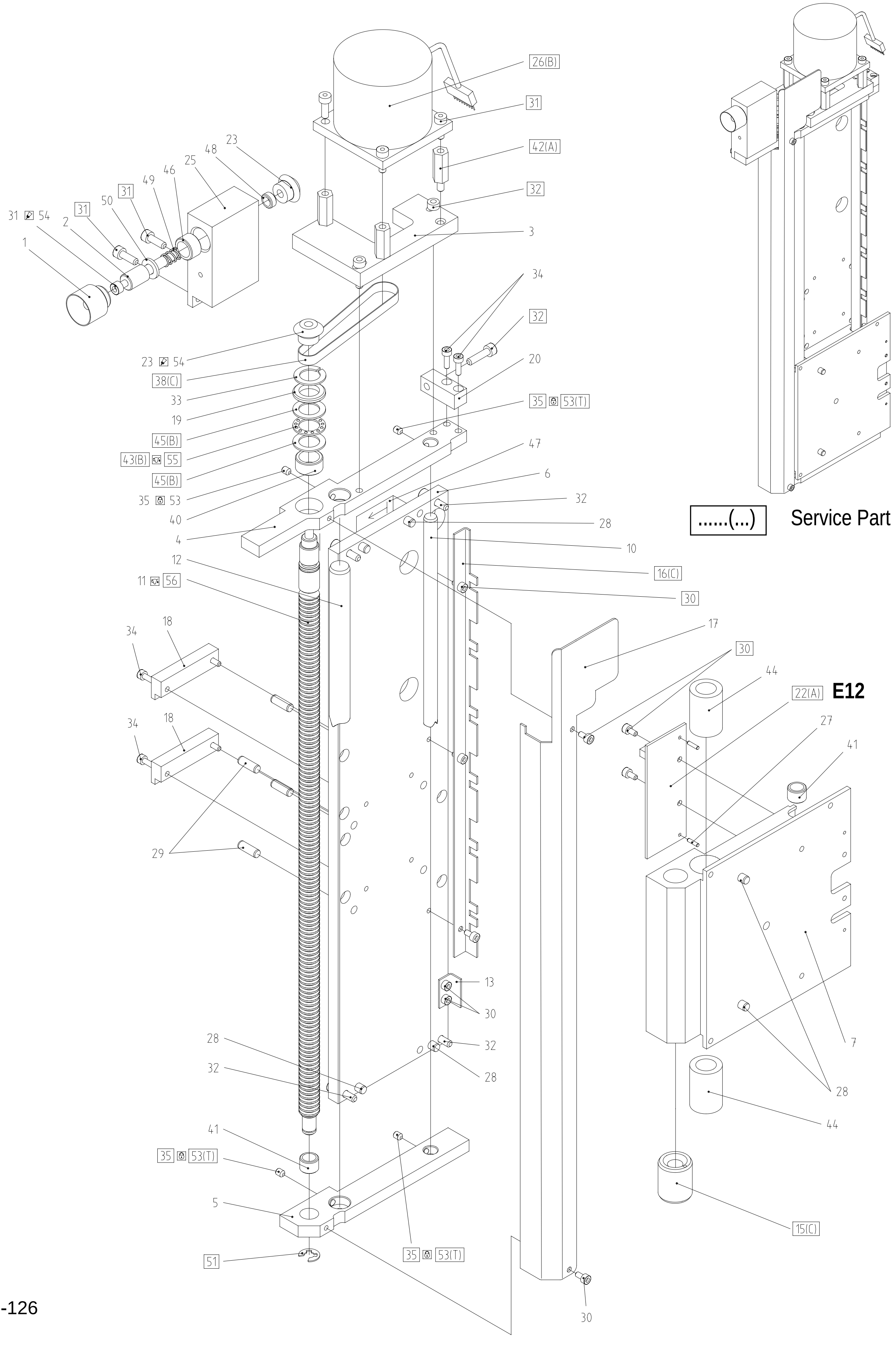
2.5.5 Spare Parts List

INCUBATOR TOWER LIFT 147293 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147294	AUFFANGBUECHSE	00	1	1.000	
147303	GETRIEBEWELLE	00	2	1.000	
147296	MOTORHALTER	00	3	1.000	
147297	FUHRUNGSHALTER OBEN	00	4	1.000	
147298	FUEHRUNGSHALTER UNTEN	00	5	1.000	
147299	LIFTGRUNDPLATTE	00	6	1.000	
147813	TOWERLIFT-SUPPORT	00	7	1.000	
147285	FUEHRUNGSWELLE	01	10	1.000	
147286	HUBSPINDEL	01	11	1.000	
147304	LAGERWELLE	01	12	1.000	
147305	INITWINKEL	00	13	1.000	
148389	MUTTER TR 12x3	00	15	1.000	
147307	POSITIONIERFAHNE	00	16	1.000	C
148234	ABDECKBLECH	00	17	1.000	
147309	LIFTHALTER	00	18	2.000	
147275	LAGERRING	00	19	1.000	
147310	EINSTELLBOCK	00	20	1.000	
146388	CONNECTORBOARD E12 PCB	00	22	1.000	A
261005	KEGELRAD Z= 16 M= 1.0	00	23	2.000	
147295	GETRIEBEHALTERUNG	00	25	1.000	
146364	STEP MOTOR E SM20	00	26	1.000	B
251903	ZYL-STIFT 2 X 8 VSM12771B	00	27	2.000	
251943	ZYL-STIFT 5 X10 VSM12771B	00	28	6.000	
251945	ZYL.-STIFT 5x14 VSM12771B	00	29	4.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	30	9.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	31	6.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	32	7.000	
414241	SICHERUNGSRING-V D=12 SEEGER V	00	33	1.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	34	6.000	
405462	GEW.STIFT M4 X 5 VERZ DIN916	00	35	4.000	
258051	ZAHNRIEMEN MXL Z= 94 X 1/4	00	38	1.000	C
253005	SINTERBZ.LAGER 12E7/16r7/ 8MM	00	40	1.000	
279365	SINTERBZ.LAGER 8E7/11R7/ 8 MM	00	41	2.000	
257040	DIST.HALTER M4X20 I/A GEW.	00	42	3.000	A
250600	AXIALLAGER ID= 12.2 AD= 19 B=2	00	43	1.000	B
259008	KUGELBCHSE 12/19 X 28	00	44	2.000	
250601	GEGENSCHEIBE	00	45	2.000	B
253016	SINTERBZ.LAGER 10E7/14r7 8MM	00	46	1.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	47	1.000	
253017	SINTERBZ.LAGER 6E7/9r7 4MM	00	48	1.000	
256122	DRUCKFEDER DA 7.6 L 15	00	49	1.000	A
409403	U-SCHEIBE M6 DIN125A	00	50	1.000	
413007	SICHERUNGSSCHEIBE 6 DIN6799	00	51	1.000	C
511006	LOCTITE 222 50mL	00	53	0.000	T
511010	LOCTITE 638 50mL	00	54	0.000	T

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
510000	SCHMIERFETT LGMT 2/0,2 SKF	00	55	0.000	T
511058	MOLYKOTE FETTPASTE DX	00	56	0.000	

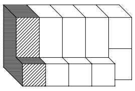
2.5.6 3D Drawing Incubator Tower Lift 147 293 revision 03

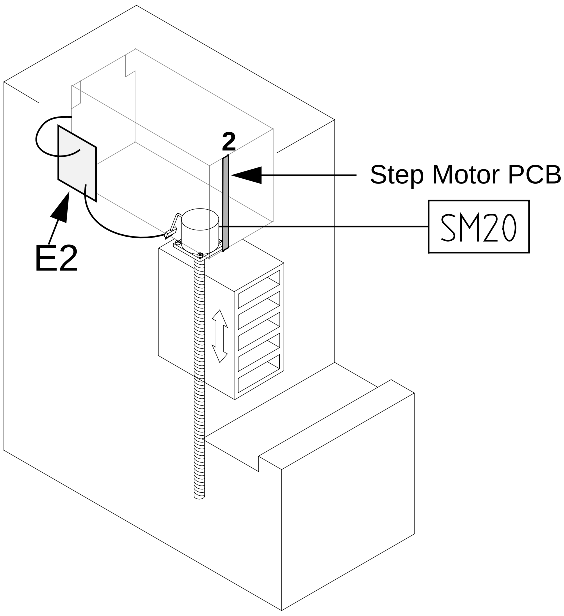

26(B)
31
42(A)
32
3
23
48
25
46
49
31
50
31 54
31
2
1
34
32
20
35 53(T)
23 54
38(C)
33
19
45(B)
43(B) 55
45(B)
35 53
40
4
47
6
32
28
10
16(C)
30
12
11 56
17
30
44
22(A)
E12
27
41
34
18
34
18
29
13
30
32
28
28
32
7
28
44
41
35 53(T)
5
51
35 53(T)
15(C)
30

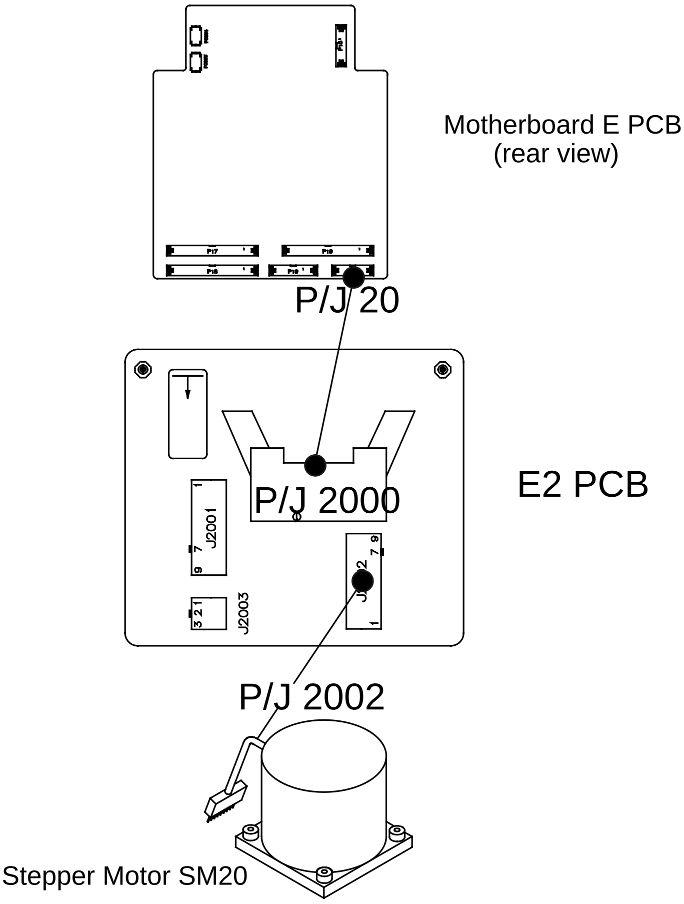
......(...) Service Part Code

2.5.7 Troubleshooting

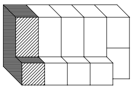
Module: Entry
Assembly: Incubator Tower Lift (Front Tower)
Actor: Stepper Motor SM20
Boards: E2, Step Motor PCB
Motherboard E
Error Message:

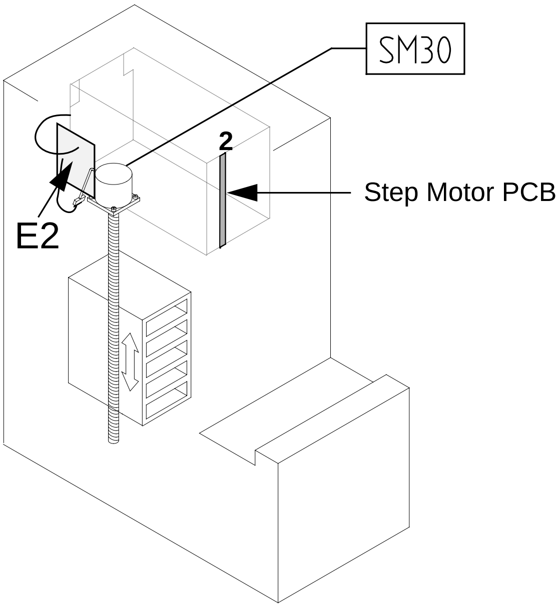


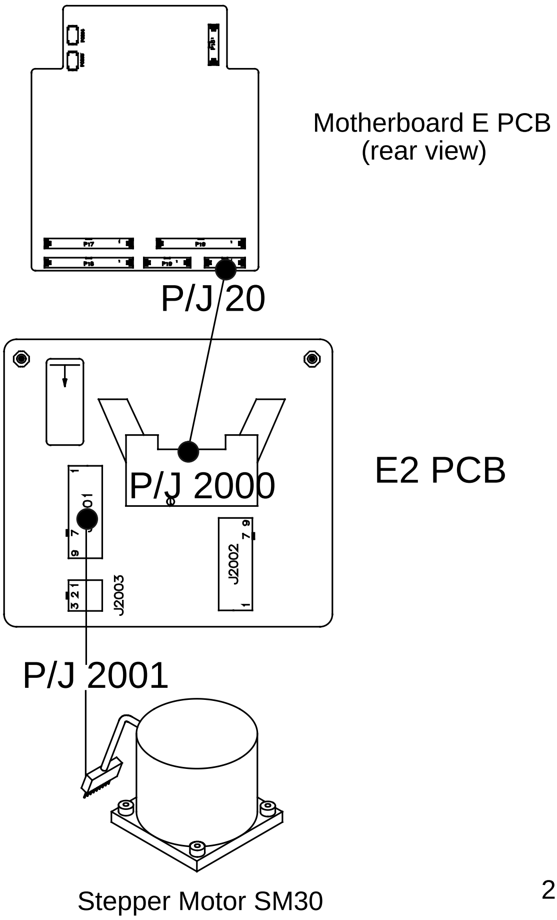

2
Step Motor PCB
SM20
E2


Motherboard E PCB
(rear view)
P/J 20
E2 PCB
P/J 2000
J2001
J2002
J2003
P/J 2002
Stepper Motor SM20

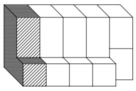
Module: Entry
Assembly: Incubator Tower Lift (Rear Tower)
Actor: Stepper Motor SM30
Boards: E2, Step Motor PCB
Motherboard E
Error Message:

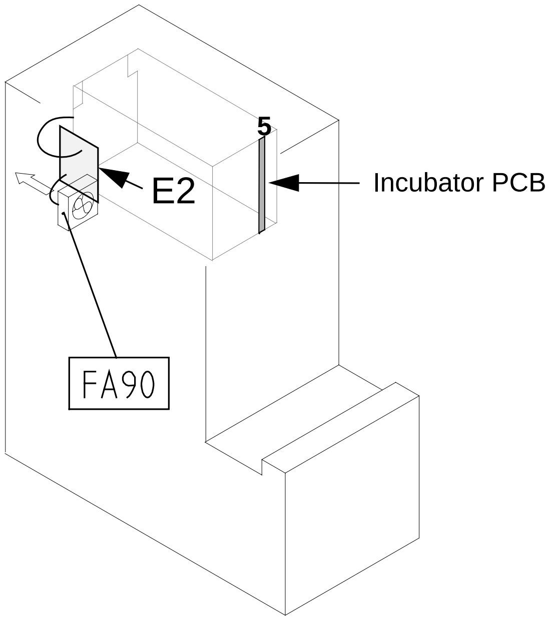


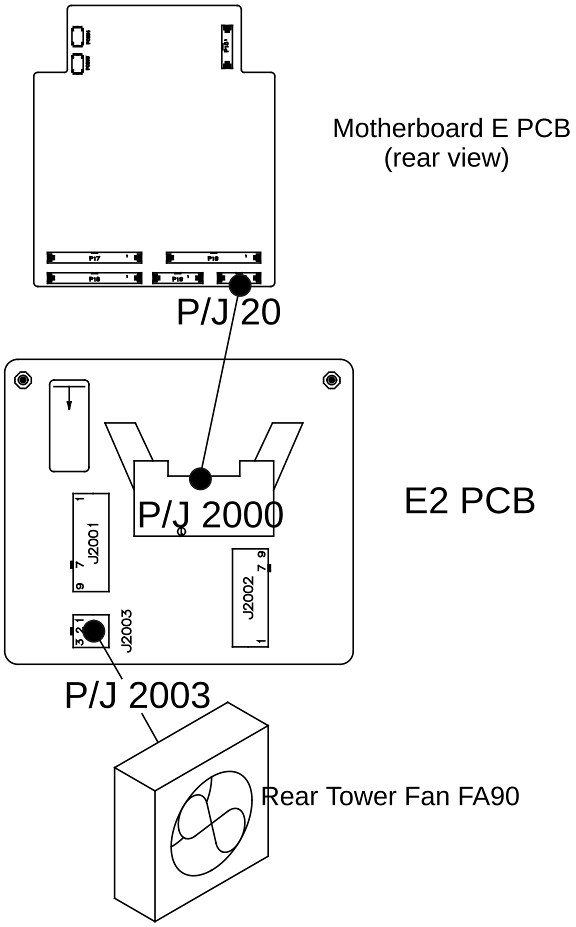

SM30
2
Step Motor PCB
E2


Motherboard E PCB
(rear view)
P/J 20
E2 PCB
P/J 2000
J2002
J2003
P/J 2001
Stepper Motor SM30

Module:	Entry
Assembly:	Incubator Tower Lift
Actor:	Rear Tower Fan FA90
Boards:	E2, Incubator PCB Motherboard E
Error Message:	



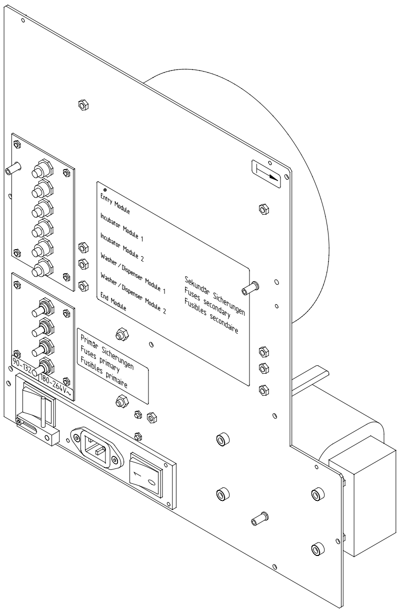

5
E2
Incubator PCB
FA90


Motherboard E PCB
(rear view)
P/J 20
E2 PCB
P/J 2000
J2001
J2002
J2003
P/J 2003
Rear Tower Fan FA90

Mains Power Unit

147 449

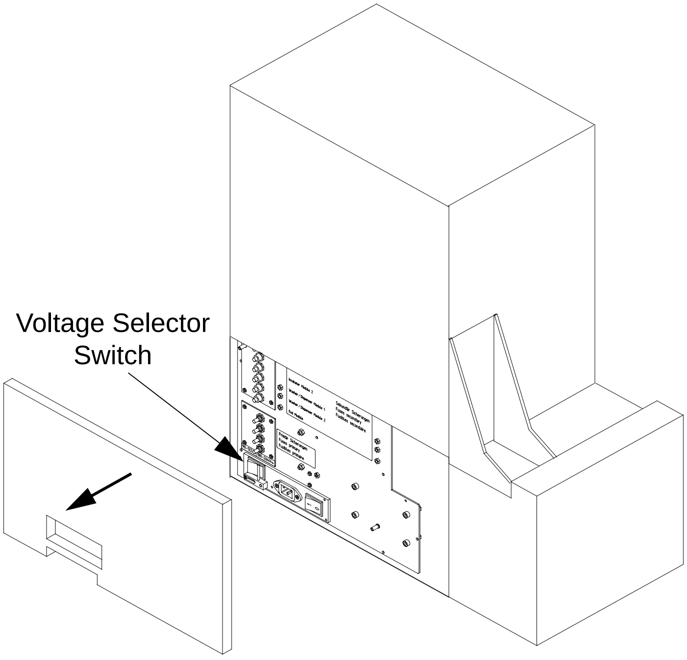
- Functional Description
- Connector Board
  - E 8 146 257
- Wiring Diagram
- Replacing Spare Parts
- Spare Parts List
- 3D Drawing


Entry Module
Incubator Module 1
Incubator Module 2
Washer / Dispenser Module 1
Washer / Dispenser Module 2
End Module
Sekundär Sicherungen
Fuses secondary
Fusibles secondaire
Primär Sicherungen
Fuses primary
Fusibles primaire
90-132
180-264V~

2.6 Mains Power Unit 147 449

2.6.1 Functional Description

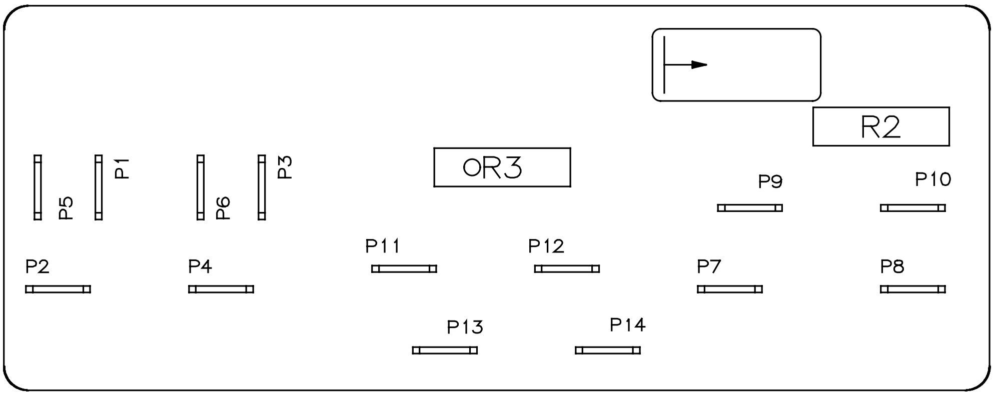
The instrument's power supply is in the Entry Module. Remove panel to access primary and secondary protection switches (circuit breakers), and the voltage selector switch.


Voltage Selector Switch

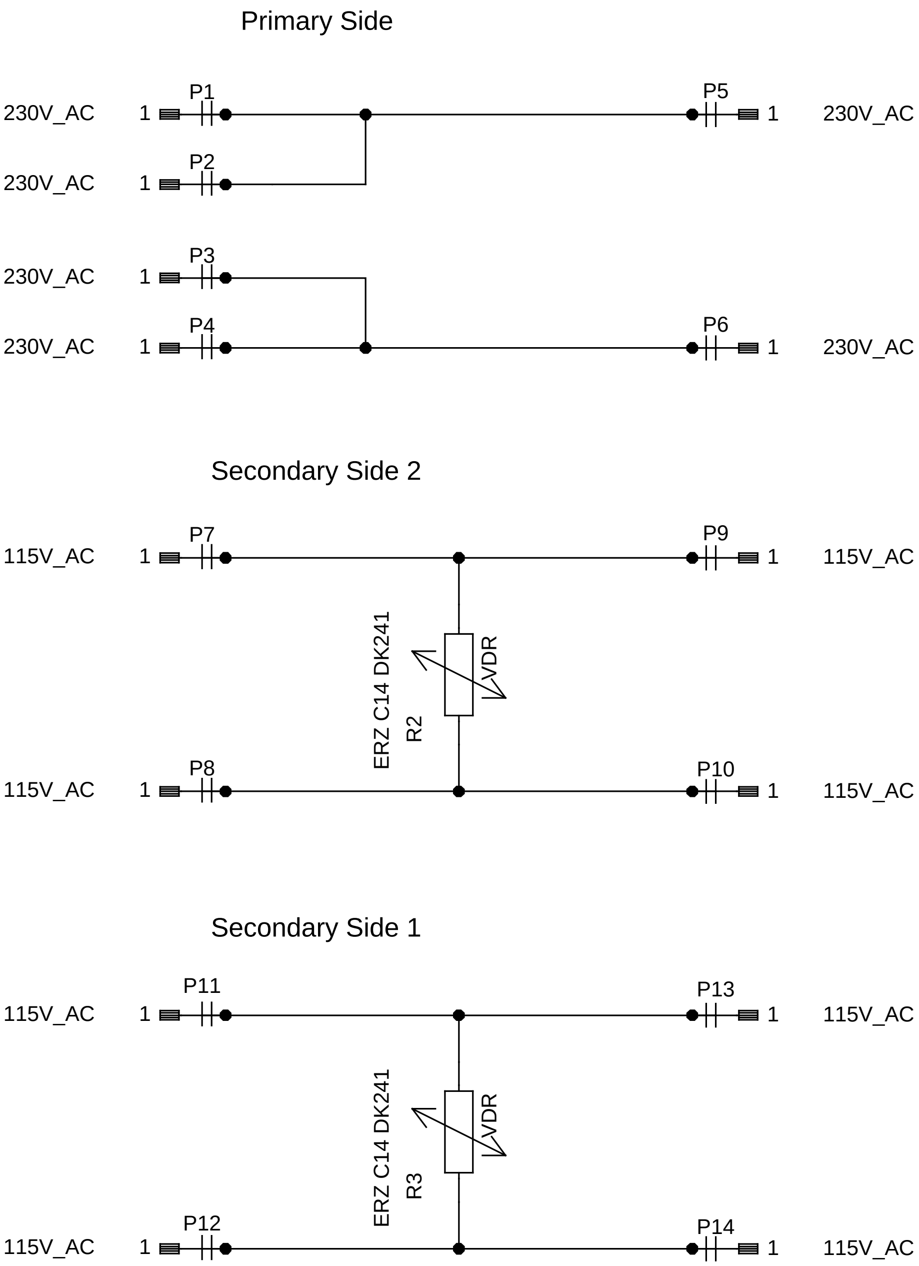
ATTENTION
Set the instrument voltage selector switch (230/115V) to the local mains voltage supply before switching the instrument on.

2.6.2 Connector Board

Connector Board E8 PCB Component Layout 146.257 revision 00

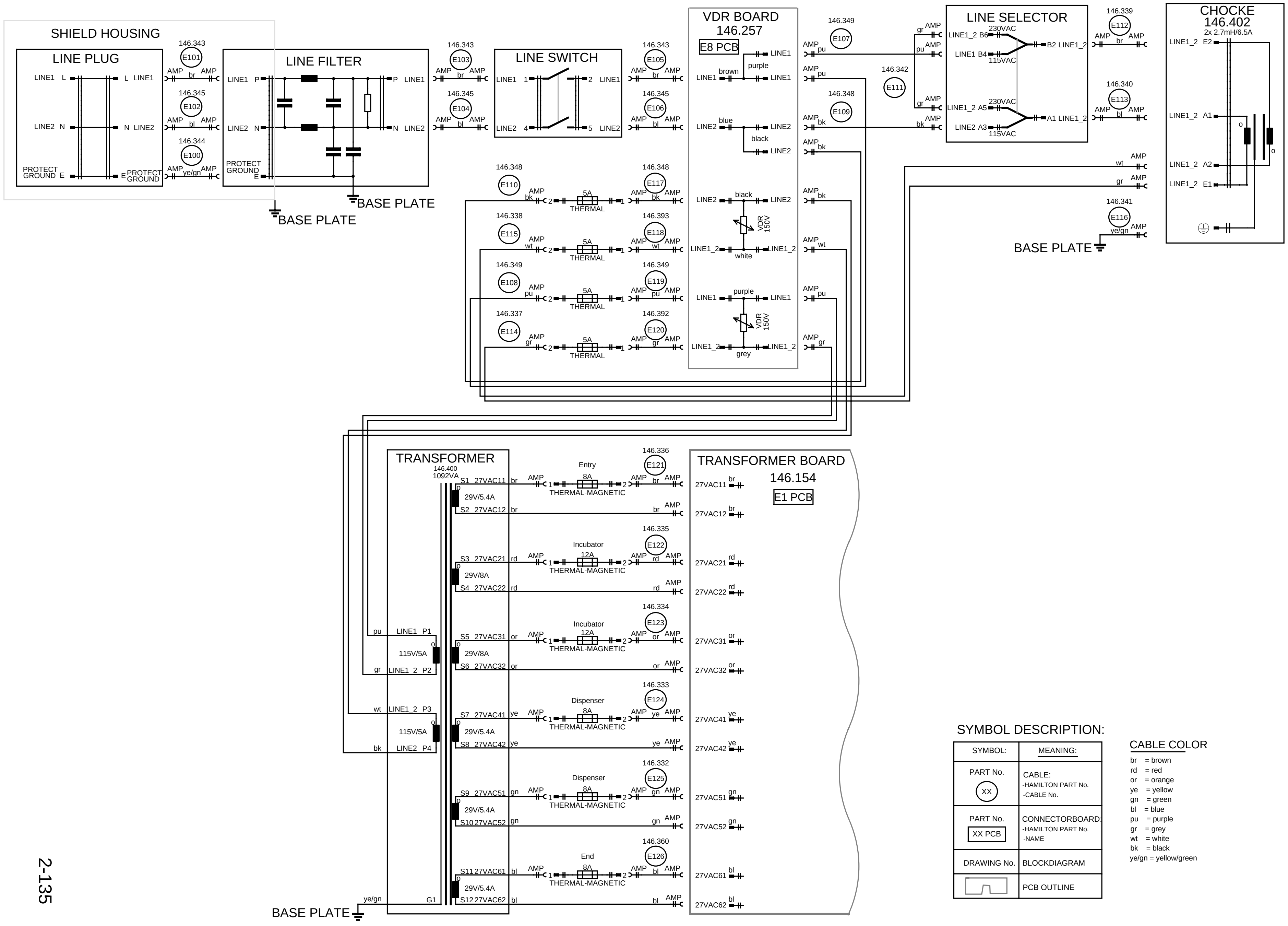

R2
OR3
P5
P1
P6
P3
P9
P10
P11
P12
P2
P4
P7
P8
P13
P14

Connector Board E8 PCB VDB Board 604.831 revision 00


Primary Side
230V_AC 1 P1
230V_AC 1 P2
P5 1 230V_AC
230V_AC 1 P3
230V_AC 1 P4
P6 1 230V_AC
Secondary Side 2
115V_AC 1 P7
P9 1 115V_AC
ERZ C14 DK241
R2
VDR
115V_AC 1 P8
P10 1 115V_AC
Secondary Side 1
115V_AC 1 P11
P13 1 115V_AC
ERZ C14 DK241
R3
VDR
115V_AC 1 P12
P14 1 115V_AC

2.6.3 Wiring Diagram

Mains Power Unit: 616 009 revision 00


SHIELD HOUSING
LINE PLUG
LINE1 L
L LINE1
LINE2 N
N LINE2
PROTECT GROUND E
E PROTECT GROUND
146.343
E101
146.345
E102
146.344
E100
AMP
br
bl
ye/gn
LINE FILTER
LINE1 P
P LINE1
LINE2 N
N LINE2
PROTECT GROUND E
BASE PLATE
BASE PLATE
146.343
E103
146.345
E104
LINE SWITCH
LINE1 1
2 LINE1
LINE2 4
5 LINE2
146.343
E105
146.345
E106
VDR BOARD
146.257
E8 PCB
LINE1
brown
purple
LINE2
blue
black
black
VDR 150V
LINE1_2
white
purple
grey
146.349
E107
pu
146.348
E109
bk
wt
gr
146.342
E111
LINE SELECTOR
LINE1_2 B6
230VAC
LINE1 B4
115VAC
B2 LINE1_2
LINE1_2 A5
LINE2 A3
A1 LINE1_2
146.339
E112
146.340
E113
146.341
E116
CHOCKE
146.402
2x 2.7mH/6.5A
LINE1_2 E2
LINE1_2 A1
LINE1_2 A2
LINE1_2 E1
BASE PLATE
146.348
E110
146.348
E117
5A
THERMAL
146.338
E115
146.393
E118
146.349
E108
146.349
E119
146.337
E114
146.392
E120
TRANSFORMER
146.400
1092VA
S1 27VAC11
29V/5.4A
S2 27VAC12
S3 27VAC21
29V/8A
S4 27VAC22
S5 27VAC31
29V/8A
S6 27VAC32
S7 27VAC41
29V/5.4A
S8 27VAC42
S9 27VAC51
29V/5.4A
S10 27VAC52
S11 27VAC61
29V/5.4A
S12 27VAC62
pu LINE1 P1
115V/5A
gr LINE1_2 P2
wt LINE1_2 P3
115V/5A
bk LINE2 P4
ye/gn G1
BASE PLATE
Entry
8A
THERMAL-MAGNETIC
146.336
E121
Incubator
12A
146.335
E122
Incubator
12A
146.334
E123
Dispenser
8A
146.333
E124
Dispenser
8A
146.332
E125
End
8A
146.360
E126
rd
or
ye
gn
TRANSFORMER BOARD
146.154
E1 PCB
27VAC11
27VAC12
27VAC21
27VAC22
27VAC31
27VAC32
27VAC41
27VAC42
27VAC51
27VAC52
27VAC61
27VAC62

SYMBOL DESCRIPTION:

SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
DRAWING No.	BLOCKDIAGRAM
	PCB OUTLINE

CABLE COLOR

br = brown
rd = red
or = orange
ye = yellow
gn = green
bl = blue
pu = purple
gr = grey
wt = white
bk = black
ye/gn = yellow/green

2.6.4 Replacing Spare Parts

Refer to the 3D drawing to replace spare parts:

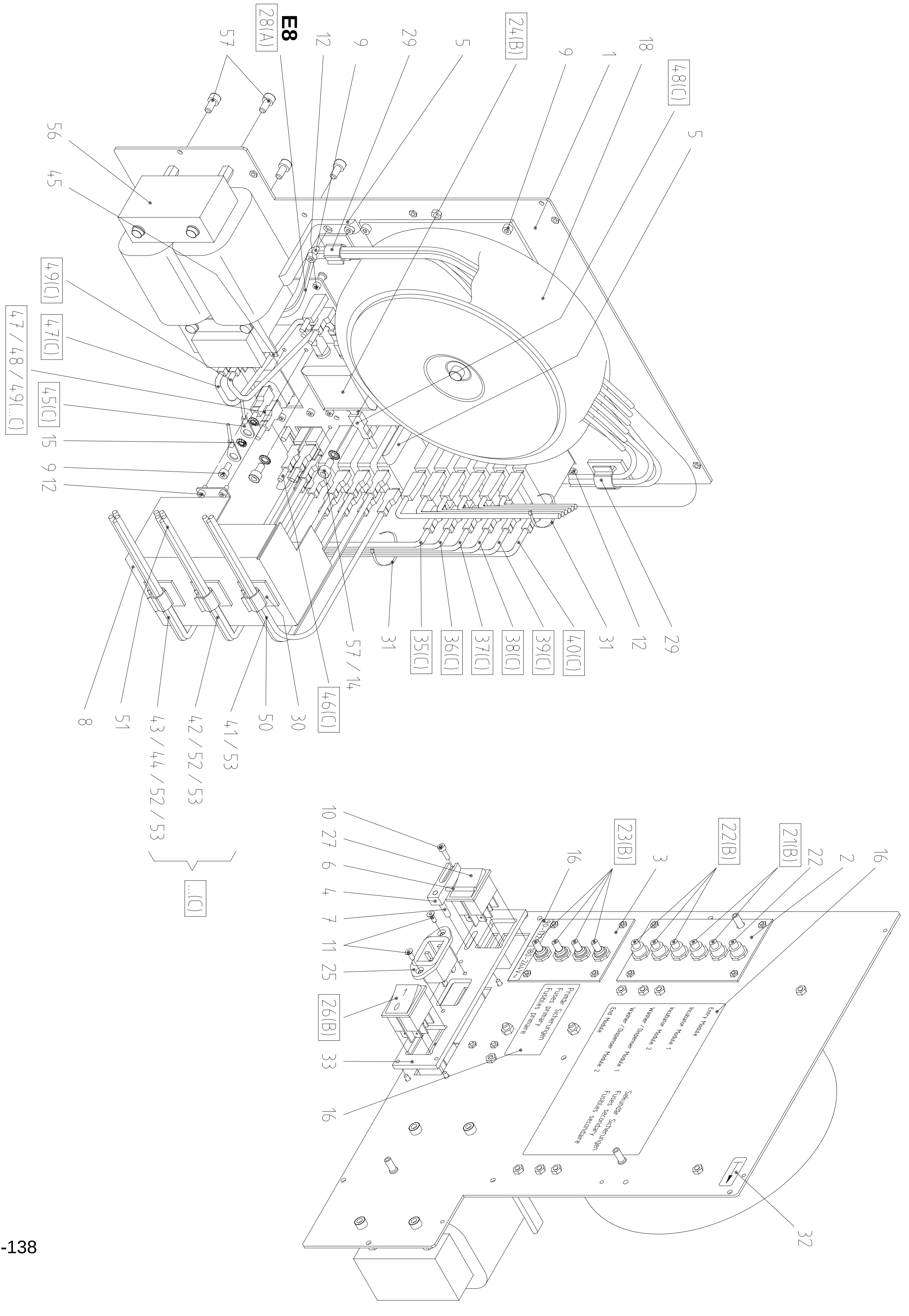
2.6.5 Spare Parts List

MAINS POWER UNIT 147449 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147456	PLATTE	00	1	1.000	
147451	BEFESTIGUNGSPLATTE 1	00	2	1.000	
147452	BEFESTIGUNGSPLATTE 2	00	3	1.000	
147453	SICHERUNG	00	4	1.000	
147454	AUFLAGEWINKEL	00	5	2.000	
251105	ZYL-STIFT 3,0X36 DIN6325	00	6	1.000	
251130	ZYL-STIFT 4 X24 DIN6325	00	7	1.000	
148161	DECKBLECH	00	8	1.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	9	9.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	10	1.000	
403453	SENKSCHRAUBE M 3X 8 DIN7991	00	11	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	12	19.000	
411003	FCHERSCHEIBE M5 DIN6798	00	14	2.000	
411002	FCHERSCHEIBE M4 DIN6798	00	15	2.000	
255028	PLATTENBESCHRIFTUNG	00	16	1.000	
146400	RINGKERNTRANSFORMATOR	00	18	1.000	
378005	GERAETESCHUTZSCHALTER 12 A	00	21	2.000	B
378004	GERAETESCHUTZSCHALTER 8 A	00	22	4.000	B
378007	GERAETESCHUTZSCHALTER 5 A	00	23	4.000	B
395018	UNIVERSALEINBAUFILTER	00	24	1.000	B
340283	EINBAUSTECKER 6100-33	01	25	1.000	
376005	EIN-AUSSCHALTER	00	26	1.000	B
376006	UMSCHALTER 2-POLIG 10 A	00	27	1.000	
146257	CONNECTORBOARD E8 PCB	00	28	1.000	A
361009	KABELBEF. 500 S	00	29	2.000	
361002	KABELBEF. 375 S	00	30	3.000	
361000	KABELBEF. L=100 B=2.5 MM	00	31	2.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	32	1.000	
147621	SCHALTERPLATTE	00	33	1.000	
146360	CABLE E143	00	35	1.000	C
146332	CABLE E142	00	36	1.000	C
146333	CABLE E141	00	37	1.000	C
146334	CABLE E140	00	38	1.000	C
146335	CABLE E139	00	39	1.000	C
146336	CABLE E138	00	40	1.000	C
146337	CABLE E114	00	41	1.000	C
146338	CABLE E115	00	42	1.000	C

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
146339	CABLE E112	00	43	1.000	C
146340	CABLE E113	00	44	1.000	C
146341	CABLE E116	00	45	1.000	C
146342	CABLE E111	00	46	1.000	C
146343	CABLE E101	00	47	3.000	C
146344	CABLE E100	00	48	1.000	C
146345	CABLE E102	00	49	3.000	C
146392	CABLE E144	00	50	1.000	
146393	CABLE E145	00	51	1.000	
146348	CABLE E109	00	52	3.000	C
146349	CABLE E107	00	53	3.000	C
146402	DROSSEL	00	56	1.000	
400342	ZYL-SCHR.M 5X10 DIN912 A2	00	57	6.000	

2.6.6 3D Drawing Mains Power Unit 147 449 revision 01

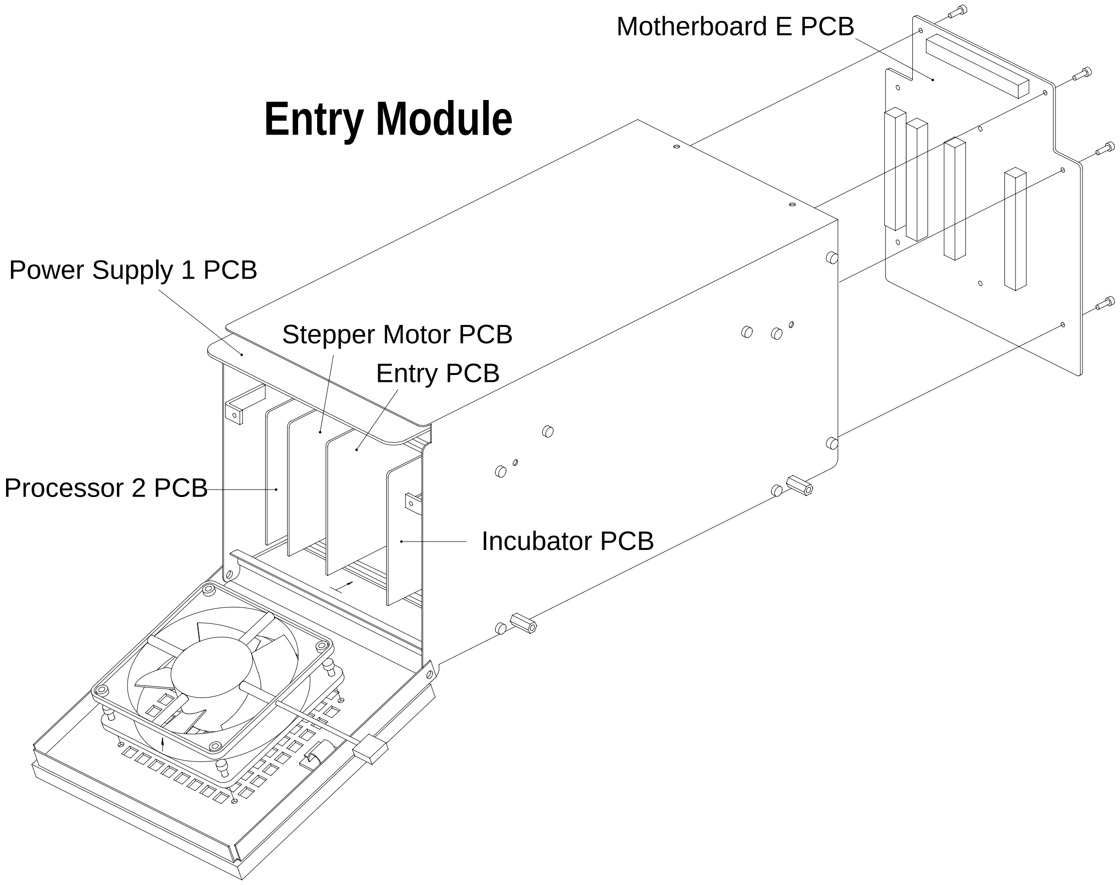

E8
28(A)
57
12
9
29
5
24(B)
9
1
18
48(C)
5
56
45
49(C)
47(C)
47 / 48 / 49(...C)
45(C)
15
9
12
8
51
43 / 44 / 52 / 53
42 / 52 / 53
41 / 53
50
30
46(C)
57 / 14
31
35(C)
36(C)
37(C)
38(C)
39(C)
40(C)
31
12
29
...(C)
10
27
6
4
7
11
25
26(B)
33
16
16
23(B)
3
22(B)
21(B)
22
2
16
32
1
0
90-132V~ / 180-264V~
Primär Sicherungen
Fuses primary
Fusibles primaire
Entry Module
Incubator Module 1
Incubator Module 2
Washer / Dispenser Module 1
Washer / Dispenser Module 2
End Module
Sekundär Sicherungen
Fuses secondary
Fusibles secondaire

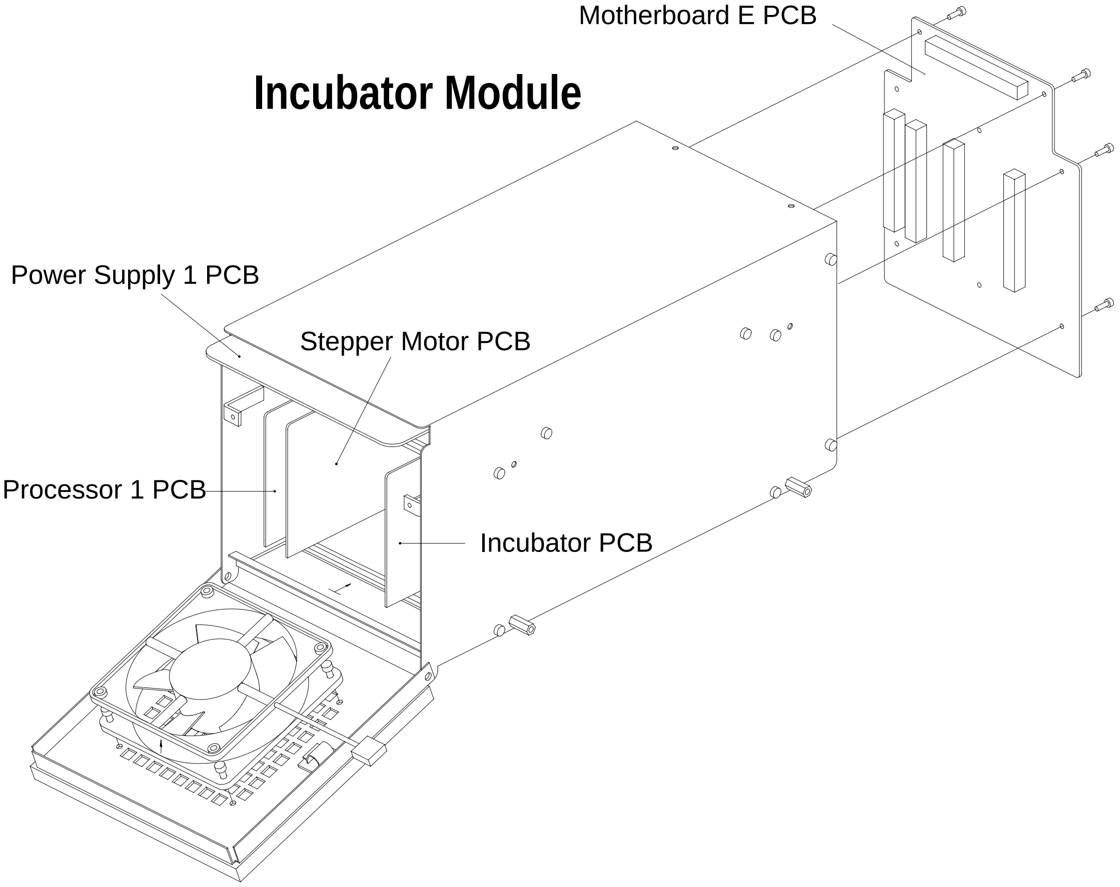
Electronic Rack

(Entry Module)

- Motherboard E PCB
  146 164
- Power Supply 1 PCB
  146 284
- Processor 1 PCB
  146 160
- Processor 2 PCB
  146 162
- Processor 3 PCB
  146 163
- Stepper Motor PCB
  146 174
- Entry PCB
  146 176
- Incubator PCB
  146 178

2.7 Entry Module Electronic Rack

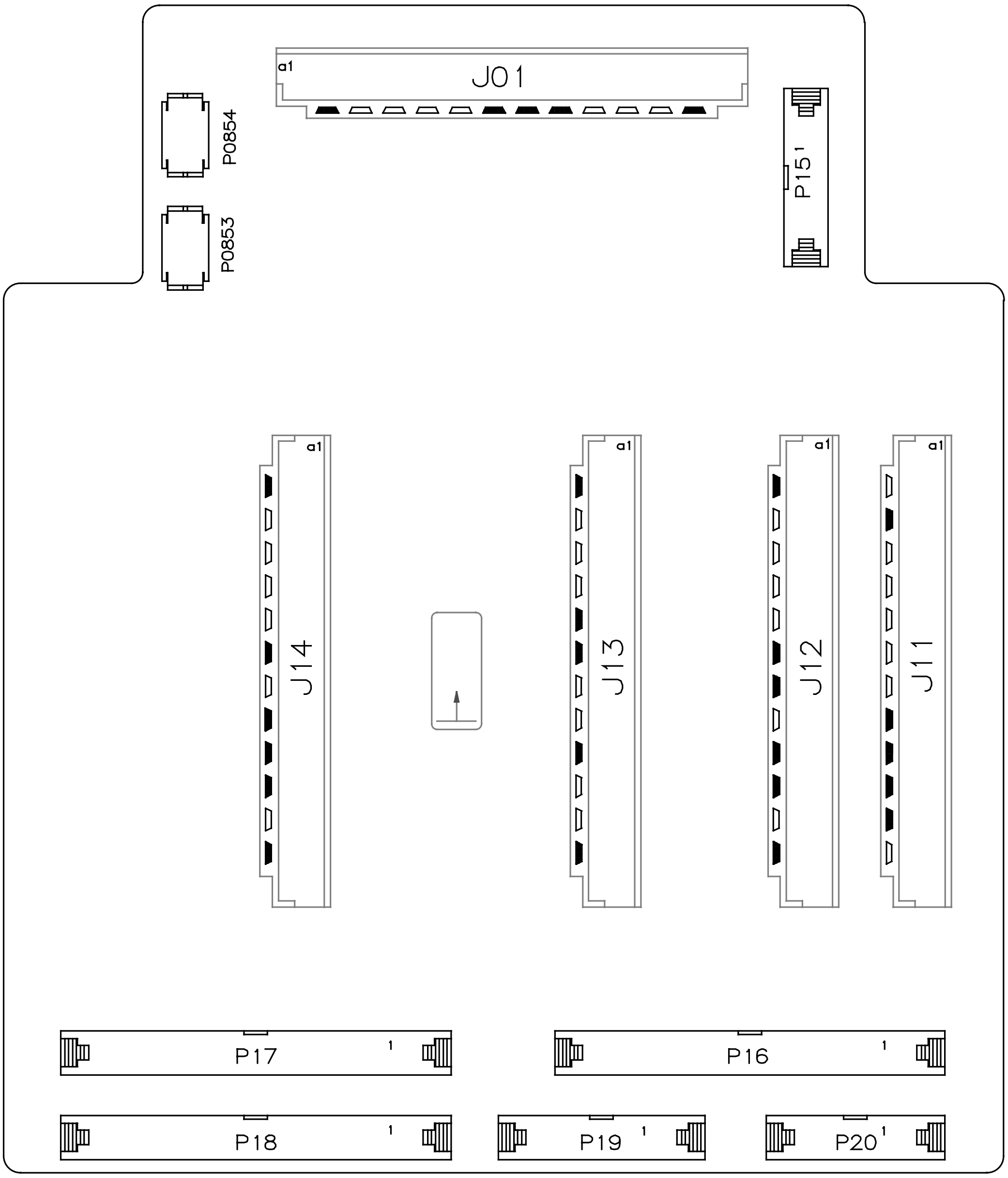

Motherboard E PCB
Entry Module
Power Supply 1 PCB
Stepper Motor PCB
Entry PCB
Processor 2 PCB
Incubator PCB


Motherboard E PCB
Incubator Module
Power Supply 1 PCB
Stepper Motor PCB
Processor 1 PCB
Incubator PCB

2.7.1 Motherboard E PCB p/n 146 164

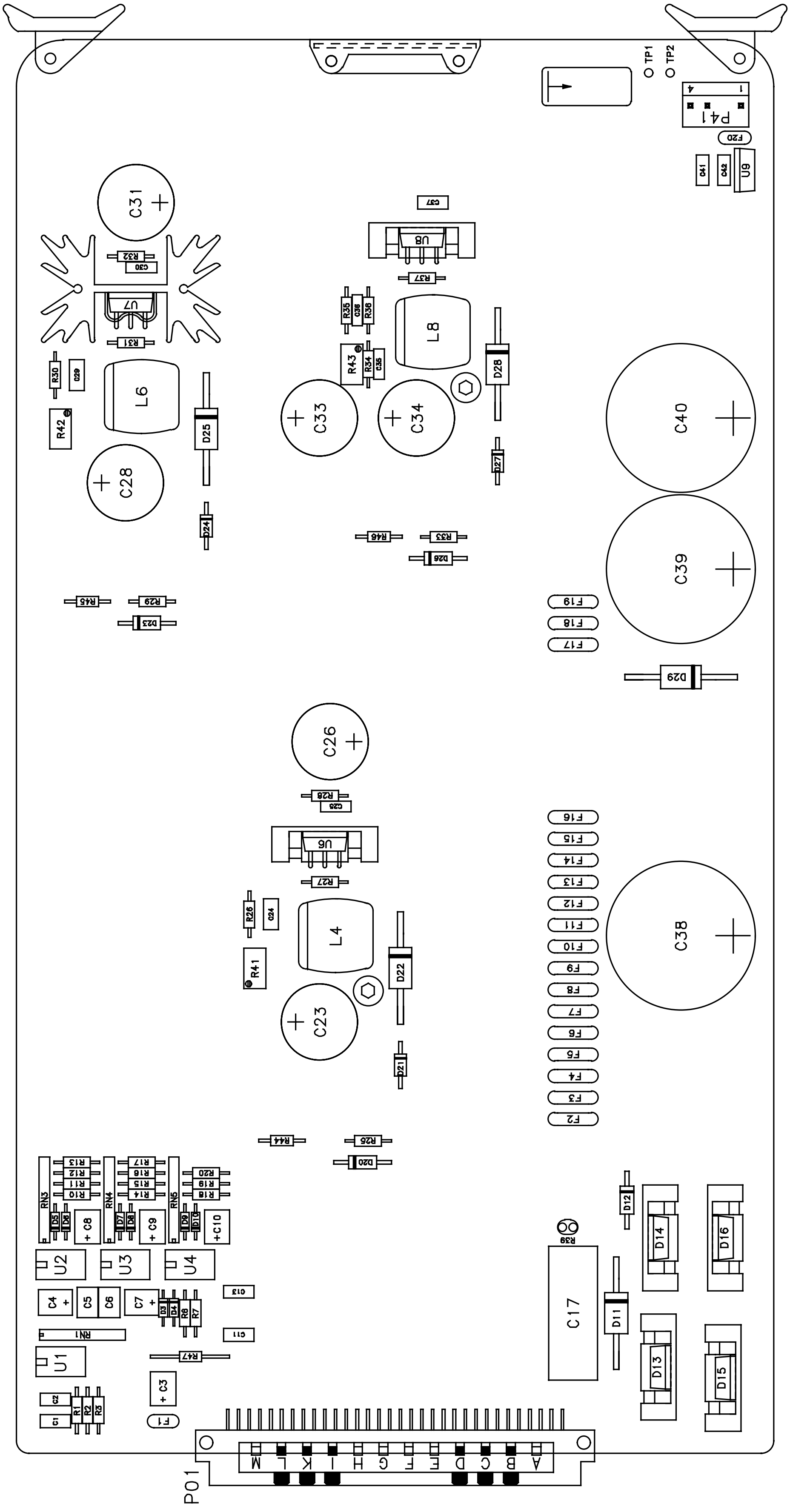
Component Layout: 146 164 revision 00

Rear View of PCB

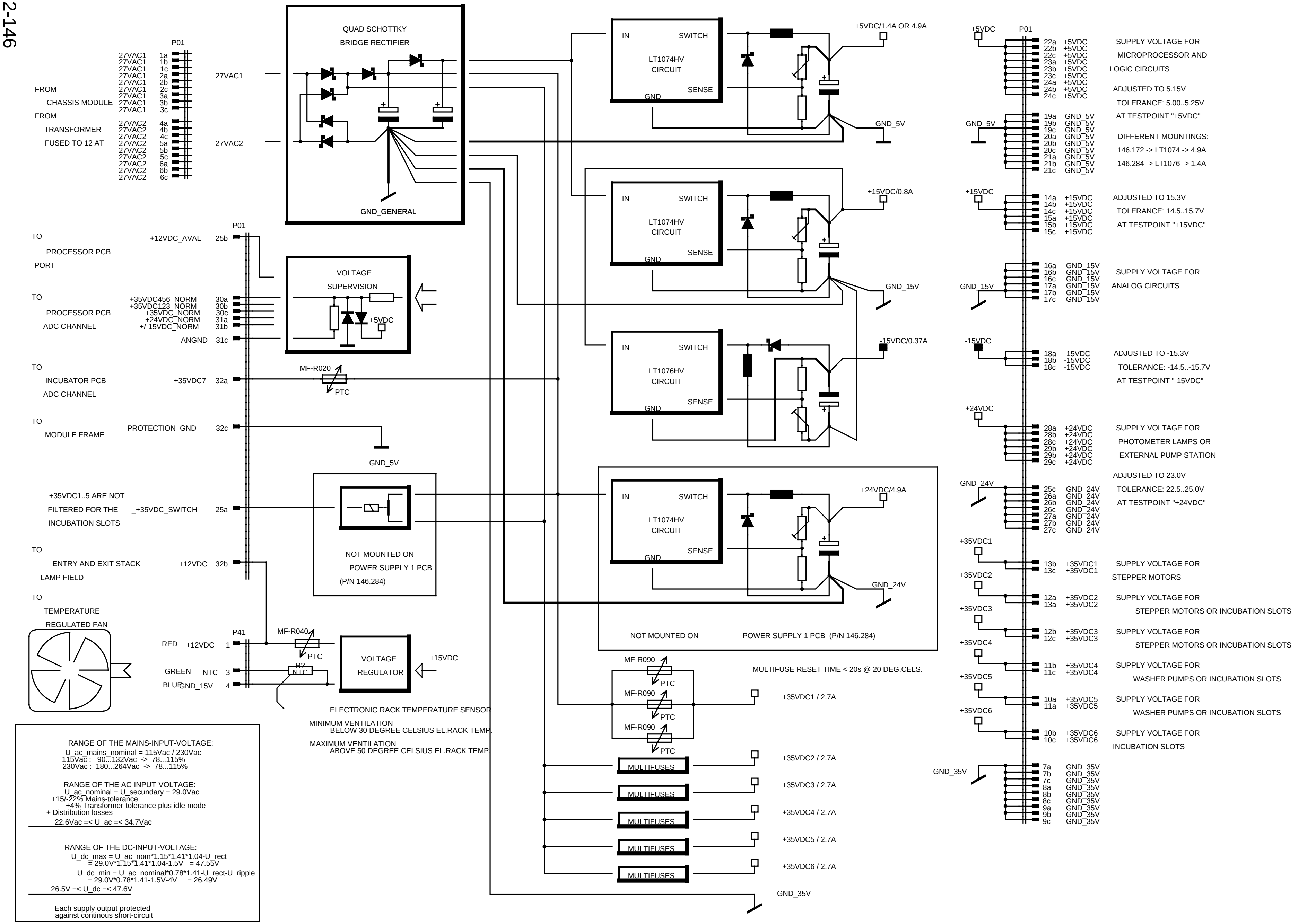

J01
a1
P0854
P0853
P15
1
J14
J13
J12
J11
a1
P17
P16
P18
P19
P20
1

2.7.2 Power Supply 1 PCB p/n 146 284

Component Layout: 146 284 revision 06


TP1
TP2
P41
F20
C41
C42
U9
C31
C37
U8
R32
C30
R37
R35
C38
R36
U7
L8
R31
R43
R34
C35
D28
R30
C29
L6
R42
C33
C34
C40
D25
D27
C28
D24
R46
R33
D26
C39
R45
R29
D23
F19
F18
F17
D29
C26
R28
C25
F16
F15
F14
F13
F12
F11
F10
F9
F8
F7
F6
F5
F4
F3
F2
U6
R27
R26
C24
L4
C38
R41
D22
C23
D21
R44
R25
D20
R13
R12
R11
R10
R17
R16
R15
R14
R20
R19
R18
RN3
RN4
RN5
D5
D6
C8
D7
D8
C9
D9
D10
C10
R39
D12
D14
D16
U2
U3
U4
C13
C4
C5
C6
C7
D3
D4
R8
R7
C17
D11
RN1
C11
D13
D15
U1
R47
C3
C2
C1
R1
R2
R3
F1
A B C D E F G H I K L M
P01

Block Diagram Power Supply 1 / 2 PCB: 614 121 revision 01


QUAD SCHOTTKY
BRIDGE RECTIFIER
GND_GENERAL
P01
27VAC1 1a
27VAC1 1b
27VAC1 1c
27VAC1 2a
27VAC1 2b
27VAC1 2c
27VAC1 3a
27VAC1 3b
27VAC1 3c
27VAC2 4a
27VAC2 4b
27VAC2 4c
27VAC2 5a
27VAC2 5b
27VAC2 5c
27VAC2 6a
27VAC2 6b
27VAC2 6c
FROM
CHASSIS MODULE
FROM
TRANSFORMER
FUSED TO 12 AT
27VAC1
27VAC2
IN
SWITCH
LT1074HV
CIRCUIT
GND
SENSE
+5VDC/1.4A OR 4.9A
GND_5V
+15VDC/0.8A
GND_15V
LT1076HV
-15VDC/0.37A
+24VDC/4.9A
GND_24V
NOT MOUNTED ON
POWER SUPPLY 1 PCB (P/N 146.284)
TO
PROCESSOR PCB
PORT
+12VDC_AVAL 25b
VOLTAGE
SUPERVISION
+5VDC
TO
PROCESSOR PCB
ADC CHANNEL
+35VDC456_NORM 30a
+35VDC123_NORM 30b
+35VDC_NORM 30c
+24VDC_NORM 31a
+/-15VDC_NORM 31b
ANGND 31c
TO
INCUBATOR PCB
ADC CHANNEL
+35VDC7 32a
MF-R020
PTC
TO
MODULE FRAME
PROTECTION_GND 32c
GND_5V
+35VDC1..5 ARE NOT
FILTERED FOR THE
INCUBATION SLOTS
_+35VDC_SWITCH 25a
NOT MOUNTED ON
POWER SUPPLY 1 PCB
(P/N 146.284)
TO
ENTRY AND EXIT STACK
LAMP FIELD
+12VDC 32b
TO
TEMPERATURE
REGULATED FAN
P41
RED +12VDC 1
GREEN NTC 3
BLUE GND_15V 4
MF-R040
PTC
R2
NTC
VOLTAGE
REGULATOR
+15VDC
ELECTRONIC RACK TEMPERATURE SENSOR
MINIMUM VENTILATION
BELOW 30 DEGREE CELSIUS EL.RACK TEMP.
MAXIMUM VENTILATION
ABOVE 50 DEGREE CELSIUS EL.RACK TEMP.
MF-R090
PTC
MF-R090
PTC
MF-R090
PTC
MULTIFUSE RESET TIME < 20s @ 20 DEG.CELS.
+35VDC1 / 2.7A
MULTIFUSES
+35VDC2 / 2.7A
MULTIFUSES
+35VDC3 / 2.7A
MULTIFUSES
+35VDC4 / 2.7A
MULTIFUSES
+35VDC5 / 2.7A
MULTIFUSES
+35VDC6 / 2.7A
GND_35V
+5VDC
P01
22a +5VDC
22b +5VDC
22c +5VDC
23a +5VDC
23b +5VDC
23c +5VDC
24a +5VDC
24b +5VDC
24c +5VDC
SUPPLY VOLTAGE FOR
MICROPROCESSOR AND
LOGIC CIRCUITS
ADJUSTED TO 5.15V
TOLERANCE: 5.00..5.25V
AT TESTPOINT "+5VDC"
GND_5V
19a GND_5V
19b GND_5V
19c GND_5V
20a GND_5V
20b GND_5V
20c GND_5V
21a GND_5V
21b GND_5V
21c GND_5V
DIFFERENT MOUNTINGS:
146.172 -> LT1074 -> 4.9A
146.284 -> LT1076 -> 1.4A
+15VDC
14a +15VDC
14b +15VDC
14c +15VDC
15a +15VDC
15b +15VDC
15c +15VDC
ADJUSTED TO 15.3V
TOLERANCE: 14.5..15.7V
AT TESTPOINT "+15VDC"
GND_15V
16a GND_15V
16b GND_15V
16c GND_15V
17a GND_15V
17b GND_15V
17c GND_15V
SUPPLY VOLTAGE FOR
ANALOG CIRCUITS
-15VDC
18a -15VDC
18b -15VDC
18c -15VDC
ADJUSTED TO -15.3V
TOLERANCE: -14.5..-15.7V
AT TESTPOINT "-15VDC"
+24VDC
28a +24VDC
28b +24VDC
28c +24VDC
29b +24VDC
29b +24VDC
29c +24VDC
SUPPLY VOLTAGE FOR
PHOTOMETER LAMPS OR
EXTERNAL PUMP STATION
ADJUSTED TO 23.0V
TOLERANCE: 22.5..25.0V
AT TESTPOINT "+24VDC"
GND_24V
25c GND_24V
26a GND_24V
26b GND_24V
26c GND_24V
27a GND_24V
27b GND_24V
27c GND_24V
+35VDC1
13b +35VDC1
13c +35VDC1
SUPPLY VOLTAGE FOR
STEPPER MOTORS
+35VDC2
12a +35VDC2
13a +35VDC2
SUPPLY VOLTAGE FOR
STEPPER MOTORS OR INCUBATION SLOTS
+35VDC3
12b +35VDC3
12c +35VDC3
SUPPLY VOLTAGE FOR
STEPPER MOTORS OR INCUBATION SLOTS
+35VDC4
11b +35VDC4
11c +35VDC4
SUPPLY VOLTAGE FOR
WASHER PUMPS OR INCUBATION SLOTS
+35VDC5
10a +35VDC5
11a +35VDC5
SUPPLY VOLTAGE FOR
WASHER PUMPS OR INCUBATION SLOTS
+35VDC6
10b +35VDC6
10c +35VDC6
SUPPLY VOLTAGE FOR
INCUBATION SLOTS
GND_35V
7a GND_35V
7b GND_35V
7c GND_35V
8a GND_35V
8b GND_35V
8c GND_35V
9a GND_35V
9b GND_35V
9c GND_35V

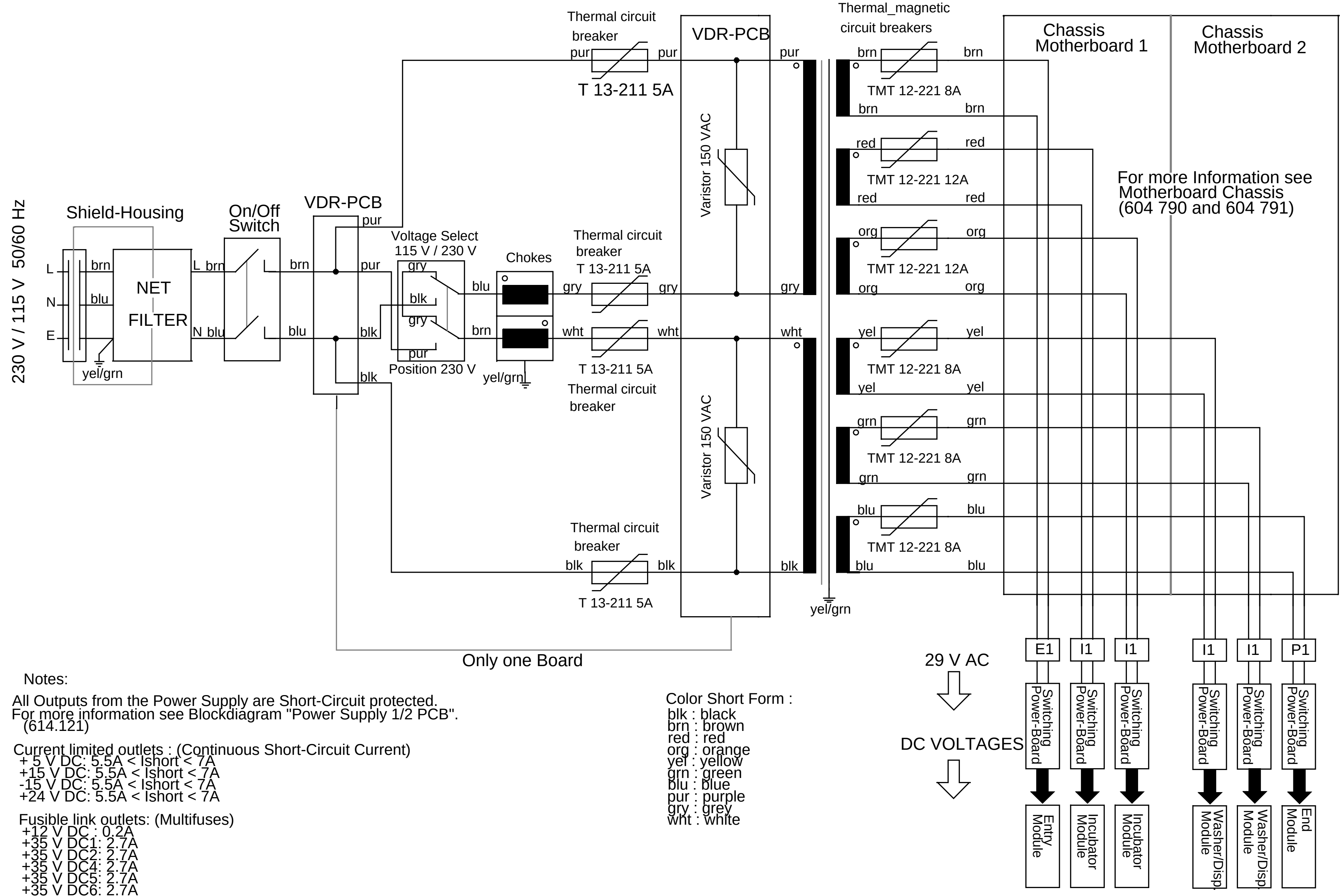
RANGE OF THE MAINS-INPUT-VOLTAGE:
U_ac_mains_nominal = 115Vac / 230Vac
115Vac : 90...132Vac -> 78...115%
230Vac : 180...264Vac -> 78...115%

RANGE OF THE AC-INPUT-VOLTAGE:
U_ac_nominal = U_secundary = 29.0Vac
+15/-22% Mains-tolerance
+4% Transformer-tolerance plus idle mode
+ Distribution losses
22.6Vac =< U_ac =< 34.7Vac

RANGE OF THE DC-INPUT-VOLTAGE:
U_dc_max = U_ac_nom*1.15*1.41*1.04-U_rect
= 29.0V*1.15*1.41*1.04-1.5V = 47.55V
U_dc_min = U_ac_nominal*0.78*1.41-U_rect-U_ripple
= 29.0V*0.78*1.41-1.5V-4V = 26.49V
26.5V =< U_dc =< 47.6V

Each supply output protected
against continous short-circuit

Block Diagram Power Distribution: 614 133 revision 00


230 V / 115 V 50/60 Hz
L
N
E
Shield-Housing
brn
blu
NET FILTER
yel/grn
L brn
N blu
On/Off Switch
brn
blu
VDR-PCB
pur
pur
blk
blk
Voltage Select 115 V / 230 V
gry
blk
gry
pur
Position 230 V
blu
brn
Chokes
yel/grn
Thermal circuit breaker
pur
pur
T 13-211 5A
Thermal circuit breaker
T 13-211 5A
gry
gry
wht
wht
T 13-211 5A
Thermal circuit breaker
Thermal circuit breaker
blk
blk
T 13-211 5A
VDR-PCB
Varistor 150 VAC
Varistor 150 VAC
pur
gry
wht
blk
yel/grn
Only one Board
Thermal_magnetic circuit breakers
brn
brn
TMT 12-221 8A
brn
brn
red
red
TMT 12-221 12A
red
red
org
org
TMT 12-221 12A
org
org
yel
yel
TMT 12-221 8A
yel
yel
grn
grn
TMT 12-221 8A
grn
grn
blu
blu
TMT 12-221 8A
blu
blu
Chassis Motherboard 1
Chassis Motherboard 2
For more Information see Motherboard Chassis (604 790 and 604 791)
E1
I1
I1
I1
I1
P1
29 V AC
DC VOLTAGES
Switching Power-Board
Switching Power-Board
Switching Power-Board
Switching Power-Board
Switching Power-Board
Switching Power-Board
Entry Module
Incubator Module
Incubator Module
Washer/Disp. Module
Washer/Disp. Module
End Module

Notes:

All Outputs from the Power Supply are Short-Circuit protected.
For more information see Blockdiagram "Power Supply 1/2 PCB".
(614.121)

Current limited outlets : (Continuous Short-Circuit Current)
+ 5 V DC: 5.5A < Ishort < 7A
+15 V DC: 5.5A < Ishort < 7A
-15 V DC: 5.5A < Ishort < 7A
+24 V DC: 5.5A < Ishort < 7A

Fusible link outlets: (Multifuses)
+12 V DC : 0.2A
+35 V DC1: 2.7A
+35 V DC2: 2.7A
+35 V DC4: 2.7A
+35 V DC5: 2.7A
+35 V DC6: 2.7A
+35 V DC6: 0.2A

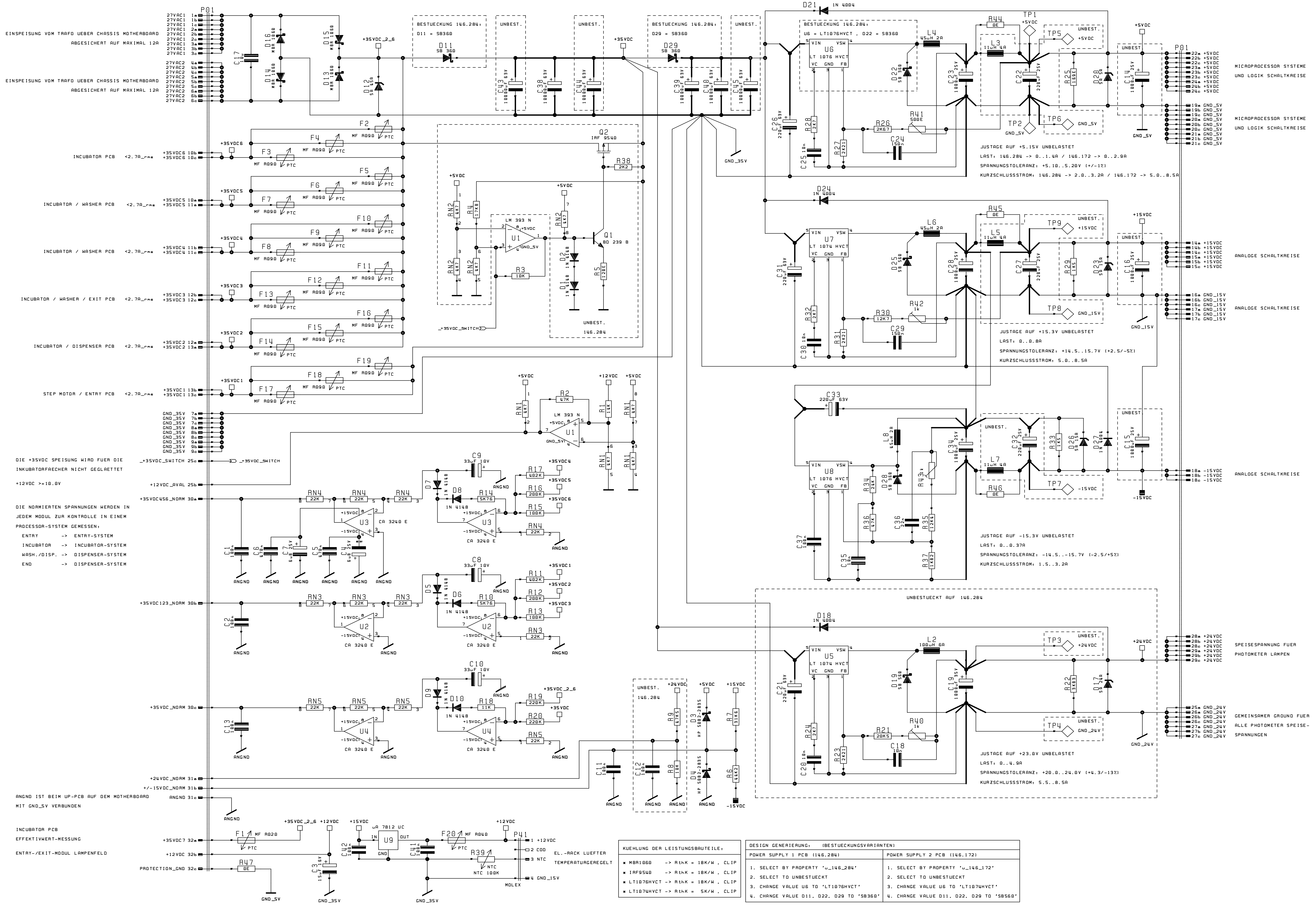
Color Short Form :
blk : black
brn : brown
red : red
org : orange
yel : yellow
grn : green
blu : blue
pur : purple
gry : grey
wht : white

Refer also to the following drawing:

- ❐ Wiring Diagram Power Supply 1 / 2 PCB: Dwg No. 604 800

Wiring Diagram Power Supply 1/2 PCB

604.800 revision 04


P01
EINSPEISUNG VOM TRAFO UEBER CHASSIS MOTHERBOARD
ABGESICHERT AUF MAXIMAL 12A
27VAC1
27VAC2
INCUBATOR PCB <2.7A_rms
INCUBATOR / WASHER PCB <2.7A_rms
INCUBATOR / WASHER / EXIT PCB <2.7A_rms
INCUBATOR / DISPENSER PCB <2.7A_rms
STEP MOTOR / ENTRY PCB <2.7A_rms
+35VDC6
+35VDC5
+35VDC4
+35VDC3
+35VDC2
+35VDC1
+35VDC_2_6
+35VDC
GND_35V
MF R090 PTC
BESTUECKUNG 146.284: D11 = SB360
BESTUECKUNG 146.284: D29 = SB360
BESTUECKUNG 146.284: U6 = LT1076HVCT , D22 = SB360
UNBEST.
IRF 9540
LM 393 N
BD 239 B
UNBEST. 146.284
_+35VDC_SWITCH
LT 1076 HVCT
LT 1074 HVCT
45uH 2A
11uH 4A
100uH 6A
JUSTAGE AUF +5.15V UNBELASTET
LAST: 146.284 -> 0..1.4A / 146.172 -> 0..2.9A
SPANNUNGSTOLERANZ: +5.10..5.20V (+/-1%)
KURZSCHLUSSSTROM: 146.284 -> 2.0..3.2A / 146.172 -> 5.0..8.5A
MICROPROCESSOR SYSTEME
UND LOGIK SCHALTKREISE
JUSTAGE AUF +15.3V UNBELASTET
LAST: 0..0.8A
SPANNUNGSTOLERANZ: +14.5..15.7V (+2.5/-5%)
KURZSCHLUSSSTROM: 5.0..8.5A
ANALOGE SCHALTKREISE
JUSTAGE AUF -15.3V UNBELASTET
LAST: 0..0.37A
SPANNUNGSTOLERANZ: -14.5..-15.7V (-2.5/+5%)
KURZSCHLUSSSTROM: 1.5..3.2A
UNBESTUECKT AUF 146.284
SPEISESPANNUNG FUER
PHOTOMETER LAMPEN
JUSTAGE AUF +23.0V UNBELASTET
LAST: 0..4.9A
SPANNUNGSTOLERANZ: +20.0..24.0V (+4.3/-13%)
KURZSCHLUSSSTROM: 5.5..8.5A
GEMEINSAMER GROUND FUER
ALLE PHOTOMETER SPEISE-
SPANNUNGEN
DIE +35VDC SPEISUNG WIRD FUER DIE
INKUBATORFAECHER NICHT GEGLAETTET
+12VDC >=10.0V
DIE NORMIERTEN SPANNUNGEN WERDEN IN
JEDEM MODUL ZUR KONTROLLE IN EINEM
PROCESSOR-SYSTEM GEMESSEN:
ENTRY -> ENTRY-SYSTEM
INCUBATOR -> INCUBATOR-SYSTEM
WASH./DISP. -> DISPENSER-SYSTEM
END -> DISPENSER-SYSTEM
_+35VDC_SWITCH 25c
+12VDC_AVAL 25b
+35VDC456_NORM 30a
+35VDC123_NORM 30b
+35VDC_NORM 30c
+24VDC_NORM 31a
+/-15VDC_NORM 31b
ANGND 31c
CA 3240 E
ANGND
ANGND IST BEIM UP-PCB AUF DEM MOTHERBOARD
MIT GND_5V VERBUNDEN
INCUBATOR PCB
EFFEKTIVWERT-MESSUNG
ENTRY-/EXIT-MODUL LAMPENFELD
+35VDC7 32a
+12VDC 32b
PROTECTION_GND 32c
uA 7812 UC
MF R040
NTC 100K
EL.-RACK LUEFTER
TEMPERATURGEREGELT
MOLEX
1 +12VDC
2 COD
3 NTC
4 GND_15V
GND_5V
GND_35V
HP 5082-2835

KUEHLUNG DER LEISTUNGSBAUTEILE:
* MBR1060 -> RthK = 18K/W , CLIP
* IRF9540 -> RthK = 18K/W , CLIP
* LT1076HVCT -> RthK = 18K/W , CLIP
* LT1074HVCT -> RthK = 5K/W , CLIP

DESIGN GENERIERUNG: (BESTUECKUNGSVARIANTEN)	
POWER SUPPLY 1 PCB (146.284)	POWER SUPPLY 2 PCB (146.172)
1. SELECT BY PROPERTY 'u_146_284'	1. SELECT BY PROPERTY 'u_146_172'
2. SELECT TO UNBESTUECKT	2. SELECT TO UNBESTUECKT
3. CHANGE VALUE U6 TO 'LT1076HVCT'	3. CHANGE VALUE U6 TO 'LT1074HVCT'
4. CHANGE VALUE D11, D22, D29 TO 'SB360'	4. CHANGE VALUE D11, D22, D29 TO 'SB560'

2.7.3 Processors PCB 1 p/n 146 160, PCB 2 p/n 146 162, PCB 3 p/n 146 163

PCB VERSIONS

The ML F.A.M.E. instrument utilizes four different PCBs. These PCBs originate from a standard PCB (p/n 146 161) and are only differentiated by their components. The boot-EPROM and the flash memories are installed before the function test, the system specific firmware is programmed into the flash memory after the ML F.A.M.E. has been installed (see download chapter).

PROCESSOR 1 PCB P/N 146 160

- ❐ Standard configuration with microprocessor, CAN, boot-EPROM, flash memory
- ❐ 16K RAM

PROCESSOR 2 PCB P/N 146 162

- ❐ Standard configuration with microprocessor, CAN, boot-EPROM, flash memory
- ❐ 16K RAM
- ❐ Barcode Decoder

PROCESSOR 3 PCB P/N 146 163

- ❐ Standard configuration with microprocessor, CAN, boot-EPROM, flash memory
- ❐ 16K RAM
- ❐ UART and RS232 driver (2 interfaces)

HIGHLIGHTS OF THE ML F.A.M.E. PCBs

- ❐ N80C196KC 16-bit CPU
- ❐ 16MHz clock frequency
- ❐ Dynamic wait state control: Access to code and data memory with 1 wait state, access on peripheral - IC with 3 wait states
- ❐ Dynamic bus-width control: Access to code and data memory over 16-bit bus, access to peripheral IC over 8-bit bus.
- ❐ Able to download, therefore firmware is “on-board-programmable”
- ❐ 64K-byte code memory in “soft” memory, therefore may be changed without changing EPROM (firmware download)
- ❐ 16K-byte non-volatile RAM (with integrated lithium battery)
- ❐ 82526 CAN-controller for 1M-bit/s inter processor-communication (without galvanic separation)
- ❐ Additional UART N82510 with RS232 driver and ESD safety network (only fitted on PROC 2)
- ❐ HBCR-1611 barcode decoder co-processor (only fitted on PROC 2)
- ❐ Chip-select decoder for 12 external peripheral ICs.
- ❐ 6 external interrupt inputs
- ❐ 3 puls generators as synchronization frequency (HSO)
- ❐ RESET switching with TL7705 voltage supervisor
- ❐ Available: All peripheral logic in HC-technology, pull-up resistors for the crossing over to TTL-logic families (LS, ALS…)
- ❐ Bus-fan-out for 12 external LS-ICs or 50 CMOS ICs
- ❐ BUS-terminations for repetitive signals ALE and CLK-HP
- ❐ 4 MOS-FET pull-down driver-outputs, 4 more may be added if needed
- ❐ 1 LED, 3 more may be added if needed
- ❐ 7 A/D-converter inputs

SERIAL INTERFACE

CAN (Controller Area Network)

The various microprocessor systems in the ML F.A.M.E. are connected by a CAN-network; the F.A.M.E. has up to 10 nodes.

CAN Bus

The nodes have parallel connections through a two-wire communication line and are not galvanically separated. The main feature of the CAN bus is the two different states it can take in: when in the idle state or when a “1” is transmitted, the bus is in an electrically “recessive” condition. This is posed through pull-up and pull-down networks for both bus routes at every node; all bus drivers are then in the tristate phase.

When a “0” is transmitted, the bus is in an electrically “hard” condition. This is forced through the bus driver of the sending node.

The resistor network on the ML F.A.M.E. processor PCB is so dimensional, that in the worst-case, the level on the CAN network (feeder tolerance, driver performance tolerance and resistance tolerance) is in order for 4 to 13 nodes. An RS-485 transceiver is utilized as the driver.

CAN Controller

The CAN controller 82526 takes command of bus work, transmission of data blocks, calculation and testing of the 15-bit hamming check sum, confirmation, repeating of an error message or handling mistake.

The clock frequency is 16MHz, this enables a maximum transfer rate of 1Mbit / per second. Further, the CAN controller controls two 8-bit ports and a programmable 16bit timer.

INTERNAL SERIAL INTERFACE P2.0/P2.1

The internal serial interface is used to communicate with the barcode decoder co-processor in the entry system and dispenser system. The baud rate is 1200 baud. Data transfer takes place within the processor PCBs at a level of 5V.

The internal serial interface in the communication system is used to communicate with the built-in photometer.

The internal serial interface in the washer system is used to communicate with the sub-processor in the external pump station.

Download of Firmware

The boot-EPROM (as program memory) is active throughout the downloading of the firmware.

The microprocessor receives the new firmware in blocks from the system over the CAN interface or the RS-232 interface. The blocks are temporarily stored in the internal RAM. The interface is also interrupted during this period.

BARCODE DECODER

The processor PCB 2, installed in the entry system and the dispenser system, is fitted with a barcode decoder subsystem; the heart is the barcode decoder chip HBCR-1611 from HP (the successor of the barcode-decoder ICs installed in the ML_AT).

The chip is run at 16MHz. Some functions are hand-wired on layout while some may be changed on the motherboard.

INDICATORS

To show the status of software tests, mistakes, etc... 1 LED (D9) is available; 2 others may be fitted.

POWER SUPPLY MONITORING

Each module's various voltage supply is generated by a local power supply and is monitored by a processor. The voltages to be monitored are normalized on either the power supply 1/2 PCB or on the processor PCB (divided at c.a. 2…4V) and are led to the A/D converter input.

+ 12VDC

+12VDC used for electronic-rack ventilator, light panel, and incubator-supply relay (on power supply 1 & 2 PCB)

Adjustments

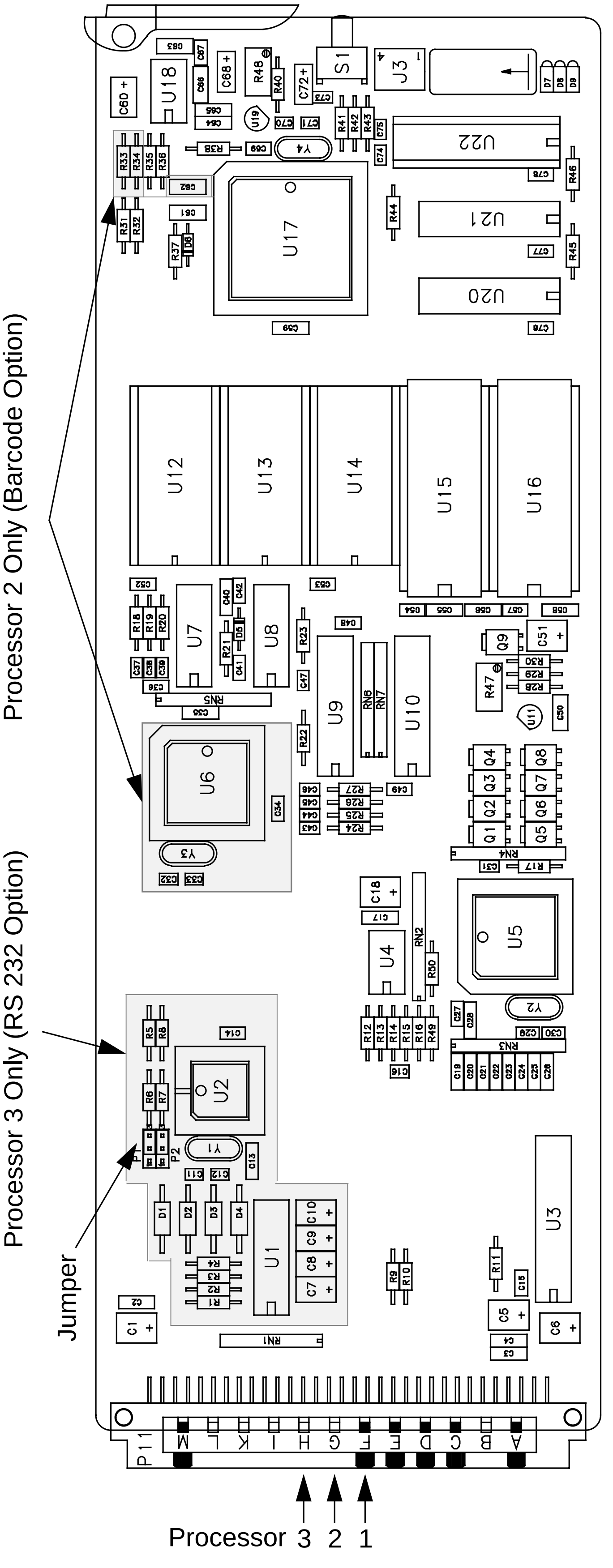
Two voltages are switched on once during the function test in production of the ML F.A.M.E. processor PCB with a preset potentiometer

Processor 1 PCB (component layout): 146 160 revision 01

Processor 2 PCB (component layout): 146 162 revision 01

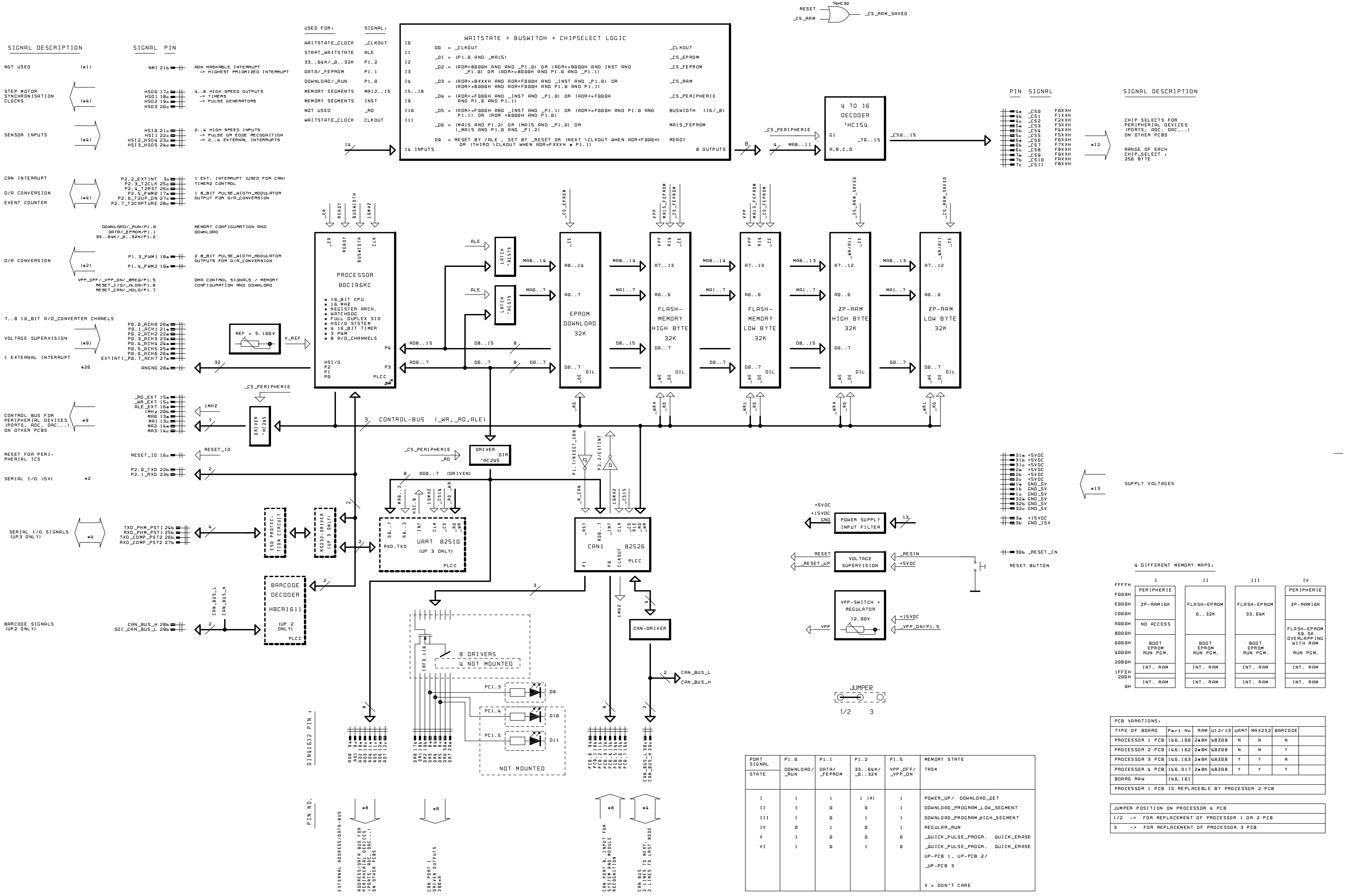
Processor 3 PCB (component layout): 146 163 revision 01

Processor 4 PCB (component layout): 146 317 revision 02


Processor 2 Only (Barcode Option)
Processor 3 Only (RS 232 Option)
Jumper
Processor 3 2 1
P11
A B C D E F G H I K L M
S1
J3
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
U12
U13
U14
U15
U16
U17
U18
U19
U20
U21
U22
Y1
Y2
Y3
Y4
P1
P2
RN1
RN2
RN3
RN4
RN5
RN6
RN7
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
D1
D2
D3
D4
D5
D6
D7
D8
D9

Block Diagram Processor 1/2/3 PCB: Dwg No. 614 120 (next page)

Block Diagram Processor 1/2/3/4/ PCB 614.120 revision 01


SIGNAL DESCRIPTION
SIGNAL PIN
NOT USED (#1) NMI 21b
NON MASKABLE INTERRUPT -> HIGHEST PRIORIZED INTERRUPT
STEP MOTOR SYNCHRONISATION CLOCKS (#4)
HSO0 17c
HSO1 18c
HSO2 19c
HSO3 20c
4..6 HIGH SPEED OUTPUTS -> TIMERS -> PULSE GENERATORS
SENSOR INPUTS (#4)
HSI0 21c
HSI1 22c
HSI2_HSO4 23c
HSI3_HSO5 24c
2..4 HIGH SPEED INPUTS -> PULSE OR EDGE RECOGNITION -> 2..4 EXTERNAL INTERRUPTS
CAN INTERRUPT
D/A CONVERSION
EVENT COUNTER
(#4)
P2.2_EXTINT 3c
P2.3_T2CLK 25c
P2.4_T2RST 26c
P2.5_PWM0 17a
P2.6_T2UP_DN 27c
P2.7_T2CAPTURE 28c
1 EXT. INTERRUPT (USED FOR CAN)
TIMER2 CONTROL
1 8_BIT PULSE_WIDTH_MODULATOR OUTPUT FOR D/A_CONVERSION
DOWNLOAD/_RUN/P1.0
DATA/_EPROM/P1.1
33..64K/_0..32K/P1.2
MEMORY CONFIGURATION AND DOWNLOAD
D/A CONVERSION (#2)
P1.3_PWM1 18a
P1.4_PWM2 19a
2 8_BIT PULSE_WIDTH_MODULATOR OUTPUTS FOR D/A_CONVERSION
VPP_OFF/_VPP_ON/_BREQ/P1.5
RESET_I/O/_HLDA/P1.6
RESET_CAN/_HOLD/P1.7
DMA CONTROL SIGNALS / MEMORY CONFIGURATION AND DOWNLOAD
7..8 10_BIT A/D_CONVERTER CHANELS
VOLTAGE SUPERVISION (#9)
1 EXTERNAL INTERRUPT
#26
P0.0_ACH0 20a
P0.1_ACH1 21a
P0.2_ACH2 22a
P0.3_ACH3 23a
P0.4_ACH4 24a
P0.5_ACH5 25a
P0.6_ACH6 26a
EXTINT1_P0.7_ACH7 27a
ANGND 28a
32
REF = 5.100V
V_REF
CONTROL BUS FOR PERIPHERIAL DEVICES (PORTS, ADC, DAC...) ON OTHER PCBS #9
_RD_EXT 15a
_WR_EXT 15c
ALE_EXT 16a
1MHz 20b
MA0 13a
MA1 13c
MA2 14a
MA3 14c
1MHZ
7
_CS_PERIPHERIE
DRIVER 'HC245
RESET FOR PERIPHERIAL ICS
RESET_IO 16c
RESET_IO
SERIAL I/O (5V) #2
P2.0_TXD 22b
P2.1_RXD 23b
2
SERIAL I/O SIGNALS (UP3 ONLY) #4
TXD_PHM_PST1 24b
RXD_PHM_PST1 25b
TXD_COMP_PST2 26b
RXD_COMP_PST2 27b
4
ESD PROTEC-TION CIRCUIT
RS232-DRIVER (UP 3 ONLY)
BARCODE SIGNALS (UP2 ONLY)
CAN_BUS_H 28b
SDI_CAN_BUS_L 29b
CAN_BUS_L
CAN_BUS_H
BARCODE DECODER HBCR1611 (UP 2 ONLY) PLCC
14
14 INPUTS
8 OUTPUTS
8
_EA READY BUSWIDTH 16MHZ
_EA READY BUSWIDTH CLK
PROCESSOR 80C196KC
* 16_BIT CPU
* 16 MHZ
* REGISTER ARCH.
* WATCHDOG
* FULL DUPLEX SIO
* HSI/O SYSTEM
* 4 16_BIT TIMER
* 3 PWM
* 8 A/D_CHANNELS
HSI/O P2 P1 P0
P4 P3 PLCC
AD8..15
AD0..7
ALE
LATCH 'AC573
MA8..14
MA0..7
D8..15
D0..7
8
_CS_EPROM
_CE A8..14 A0..7 EPROM DOWNLOAD 32K D0..7 DIL _OE
VPP MA15_FEPROM _CS_FEPROM
VPP A14 _CE A7..13 A0..6 FLASH-MEMORY HIGH BYTE 32K D0..7 DIL _WE _OE
VPP A14 _CE A7..13 A0..6 FLASH-MEMORY LOW BYTE 32K D0..7 DIL _WE _OE
MA1..7
MA8..13
_CS_RAM_SAVED
_WR/A11 _CE A7..12 A0..6 ZP-RAM HIGH BYTE 32K D0..7 DIL _WE _OE
_WR/A11 _CE A7..12 A0..6 ZP-RAM LOW BYTE 32K D0..7 DIL _WE _OE
_RD _WRH _WRL
3 CONTROL-BUS (_WR,_RD,ALE)
74HC32
RESET
_CS_RAM
_CS_RAM_SAVED
4 TO 16 DECODER 'HC154
_CS_PERIPHERIE
G1
_Y0..15
A,B,C,D
4 MA8..11
_CS0..15
PIN SIGNAL
4a _CS0 F0XXH
4b _CS1 F1XXH
4c _CS2 F2XXH
5a _CS3 F3XXH
5b _CS4 F4XXH
5c _CS5 F5XXH
6a _CS6 F6XXH
6b _CS7 F7XXH
6c _CS8 F8XXH
7a _CS9 F9XXH
7b _CS10 FAXXH
7c _CS11 FBXXH
#12
SIGNAL DESCRIPTION
CHIP SELECTS FOR PERIPHERIAL DEVICES (PORTS, ADC, DAC...) ON OTHER PCBS
RANGE OF EACH CHIP_SELECT : 256 BYTE
_CS_PERIPHERIE
_RD
DRIVER DIR 'AC245
8 AD0..7 (DRIVEN)
MA0..2 HSI.0 16MHZ _CS14 _RD _WR
D0..7 A0..2 INT CLK _CS _RD _WR
UART 82510 (UP 3 ONLY) RXD,TXD PLCC
P1.7/RESET_CAN
P2.2/EXTINT
_R_CAN 16MHZ _CS15
_RST AD0..7 _INT CLK _CS ALE _RD _WR
CAN1 82526
P1 P0 CLKOUT PLCC
3
1MHZ
4
CAN-DRIVER
2 CAN_BUS_L CAN_BUS_H
IRFD 110
8 DRIVERS
4 NOT MOUNTED
PC1.3 D9
PC1.4 D10
PC1.5 D11
NOT MOUNTED
DIN41612 PIN :
AD0 9a
AD1 9c
AD2 10a
AD3 10c
AD4 11a
AD5 11c
AD6 12a
AD7 12c
DR0 17b
DR1 18b
DR2 19b
DR3 8a
DR4 8b
DR5 8c
DR6 30a
DR7 29a
PC0.0 9b
PC0.1 10b
PC0.2 11b
PC0.3 12b
PC0.4 13b
PC0.5 14b
PC0.6 15b
PC0.7 16b
CAN_BUS_L 30c
CAN_BUS_H 29c
PIN NO.
#8
#8
#8
#4
EXTERNAL ADDRESS/DATA-BUS
ADDRESS/DATA BUS FOR PERIPHERIAL DEVICES (PORTS, ADC, DAC...) ON OTHER PCBS
CAN PORT 1 DRIVEN OUTPUTS 200mA
CAN PORT 0, INPUT FOR SYSTEM AND MODULE RECOGNITION
CAN BUS 2 LINES TO NEXT, 2 LINES TO LAST NODE
31a +5VDC
31b +5VDC
31c +5VDC
2a +5VDC
2b +5VDC
2c +5VDC
1a GND_5V
1b GND_5V
1c GND_5V
32a GND_5V
32b GND_5V
32c GND_5V
3a +15VDC
3b GND_15V
#13
SUPPLY VOLTAGES
+5VDC
+15VDC
GND
POWER SUPPLY INPUT FILTER
13
RESET
_RESET_UP
VOLTAGE SUPERVISION
_RESIN
+5VDC
30b _RESET_IN
RESET BUTTON
VPP
VPP-SWITCH + REGULATOR 12.00V
+15VDC
_VPP_ON/P1.5
JUMPER
1/2 3

USED FOR:	SIGNAL:	
WAITSTATE_CLOCK	_CLKOUT	I0
START_WAITSTATE	ALE	I1
33..64K/_0..32K	P1.2	I2
DATA/_FEPROM	P1.1	I3
DOWNLOAD/_RUN	P1.0	I4
MEMORY SEGMENTS	MA12..15	I5..I8
MEMORY SEGMENTS	INST	I9
NOT USED	_RD	I10
WAITSTATE_CLOCK	CLKOUT	I11

WAITSTATE + BUSWITDH + CHIPSELECT LOGIC

```
O0  = _CLKOUT                                                            _CLKOUT
_O1 = (P1.0 AND _MA15)                                                   _CS_EPROM
_O2 = (ADR<B000H AND AND _P1.0) OR (ADR<=B000H AND INST AND              _CS_FEPROM
         _P1.0) OR (ADR>=8000H AND P1.0 AND _P1.1)
_O3 = (ADR>=BXXXH AND ADR<F000H AND _INST AND _P1.0) OR                  _CS_RAM
      (ADR>=B000H AND ADR<F000H AND P1.0 AND P1.1)
_O4 = (ADR>=F000H AND _INST AND _P1.0) OR (ADR<=F000H                    _CS_PERIPHERIE
       AND P1.0 AND P1.1)
_O5 = (ADR>=F000H AND _INST AND _P1.1) OR (ADR>=F000H AND P1.0 AND       BUSWIDTH (16/_8)
       P1.1) OR (ADR <8000H AND P1.0)
_O6 = (MA15 AND P1.2) OR (MA15 AND _P1.0) OR                             MA15_FEPROM
      (_MA15 AND P1.0 AND _P1.2)
O9  = RESET BY /ALE , SET BY _RESET OR (NEXT \CLKOUT WHEN ADR<F000H)     READY
        OR (THIRD \CLKOUT WHEN ADR=FXXXH * P1.1)
14 INPUTS                                                                8 OUTPUTS
```

4 DIFFERENT MEMORY MAPS:

	I	II	III	IV
FFFFH – F000H	PERIPHERIE	FLASH-EPROM 0..32K	FLASH-EPROM 33.64K	PERIPHERIE
F000H – A000H	ZP-RAM16K			ZP-RAM16K
A000H – 8000H	NO ACCESS			FLASH-EPROM 59.5K OVERLAPPING WITH RAM RUN PGM.
8000H – 2080H	BOOT EPROM RUN PGM.	BOOT EPROM RUN PGM.	BOOT EPROM RUN PGM.	
2080H – 1FFEH	INT. RAM	INT. RAM	INT. RAM	INT. RAM
1FFEH – 200H				
200H – 0H	INT. RAM	INT. RAM	INT. RAM	INT. RAM

PCB VARATIONS:

TYPE OF BOARD	Part No	RAM	U12/13	UART	MAX232	BARCODE
PROCESSOR 1 PCB	146.160	2*8K	48Z08	N	N	N
PROCESSOR 2 PCB	146.162	2*8K	48Z08	N	N	Y
PROCESSOR 3 PCB	146.163	2*8K	48Z08	Y	Y	N
PROCESSOR 4 PCB	146.317	2*8K	48Z08	Y	Y	Y
BOARD RAW	146.161					

PROCESSOR 1 PCB IS REPLACEBLE BY PROCESSOR 2 PCB

JUMPER POSITION ON PROCESSOR 4 PCB

1/2 -> FOR REPLACEMENT OF PROCESSOR 1 OR 2 PCB

3 -> FOR REPLACEMENT OF PROCESSOR 3 PCB

PORT SIGNAL / STATE	P1.0 DOWNLOAD/ _RUN	P1.1 DATA/ _FEPROM	P1.2 33..64K/ _0..32K	P1.5 VPP_OFF/ _VPP_ON	MEMORY STATE TASK
I	1	1	1 (X)	1	POWER_UP/ DOWNLOAD_GET
II	1	0	0	1	DOWNLOAD_PROGRAM_LOW_SEGMENT
III	1	0	1	1	DOWNLOAD_PROGRAM_HIGH_SEGMENT
IV	0	1	0	1	REGULAR_RUN
V	1	0	0	0	_QUICK_PULSE_PROGR. QUICK_ERASE
VI	1	0	1	0	_QUICK_PULSE_PROGR. QUICK_ERASE
					UP-PCB 1, UP-PCB 2/
					_UP-PCB 3
					X = DON'T CARE

2.7.4 Stepper Motor PCB p/n 146 174

HIGHLIGHTS OF THE STEPPER MOTOR PCB

- Can drive 3 stepper motors (SE1, SM2, SM3) in full, half, or micro step modes.
- Control of 3 two or four phase stepper motors (bipolar)
- Operation in full or half step and with 4, 8 or 16 micro steps per full step
- Phase currents DC until 2A peak 1.4 A RMS respectively.
- Chopper frequency 22 KHz
- MOS FET full bridge driver
- Cooling possible through power dip case
- Phase current intensity and phase polarity become synchronously latched with the micro step frequency.
- Stepper motor end stage SE1 in combination with the counter - IC and the GAL - IC (Escap PP 520):

  Step operation (counter - IC)

  Position monitoring

  Overload recognition

  Position monitoring

  Overload recognition

  No clock speed necessary

CONSTRUCTION AND DESCRIPTION

The stepper motor PCB is the interface between the microprocessor system and 3 independent stepper motors with applicable initialization elements, optical switches, or hall sensors.

The first stepper motor end-stage (SE1), in combination with the counter IC (HCTL 2020) and the GAL (Generic Array Logic) - IC (20V8A_15), allows the disc magnet stepper motor with integrated hall-effect-sensors (ESCAP PP 520-258 004) to be driven.

Operations:

- Open Loop Solution (SM2, SM3):

  Stepper motors without decoders are used.

  Non-monitored step operation

The stepper motor PCB consists of the following:

- ❒ I/O port 82C55A-2
- ❒ The counter-IC HCTL 2020 monitors the step position and step counting.
- ❒ The GAL - IC 20V8A_15 consists of:

  Switch logic

  Self-commutation <-> micro step operation

  Built-in photometer processor <-> Hamilton processor
- ❒ An input buffer is used for level adaptation between the built-in photometer processor PCB and the Hamilton stepper motor PCB.
- ❒ Each of the three stepper motor end stages consist of two D/A converters (PM 7224), two full bridge drivers (L6202), and a current controller (L6506).
- ❒ Latch - IC 74HC75 is used to synchronize the I/O ports 82C55A-2 with the D/A - converters 7224 (synchronization of the phase polarity with the phase current intensity).
- ❒ Interface between the initialization elements, optical switch, or hall sensors, and microprocessor system.

D/A - Converter PM7224 for Stepper Motor Control

The D/A converter PM7224 is an 8-bit converter with voltage output. It sends the stepper-motor phase current over the “current controller” IC L6506. The IC contains two data registers.

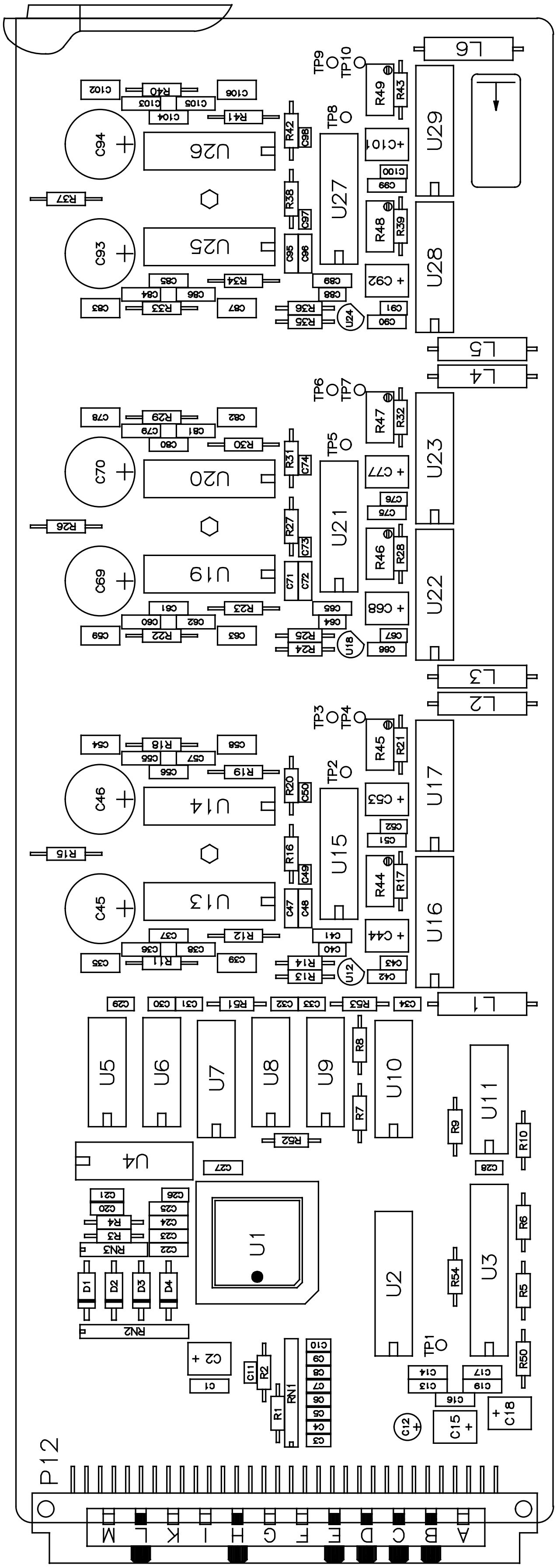
- ❒ The input register is loaded through a writing process over the A/D bus.

Refer to the drawings on following pages:

- ❒ Step Motor PCB (component layout): Dwg No. 146 174
- ❒ Block Diagram Step Motor PCB: Dwg No. 614 122:

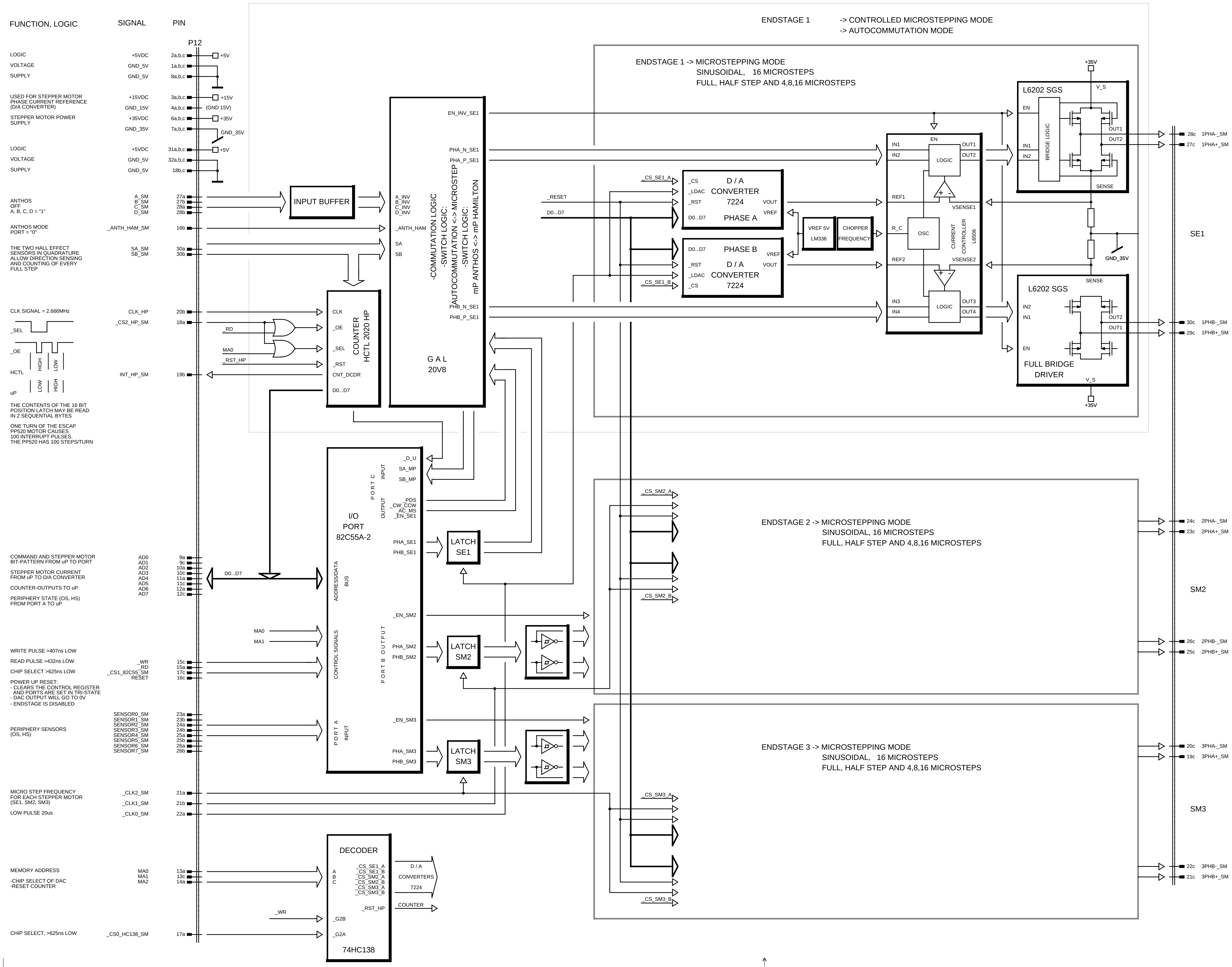
Step Motor PCB (component layout): Dwg No. 146 174

revision 00


L6
TP9
TP10
TP8
U29
U26
U27
C94
C93
U25
U28
L5
L4
TP6
TP7
TP5
U23
U20
U21
C70
C69
U19
U22
L3
L2
TP3
TP4
TP2
U17
U14
U15
C46
C45
U13
U16
L1
U5
U6
U7
U8
U9
U10
U11
U4
U1
U2
U3
D1
D2
D3
D4
RN2
RN1
RN3
TP1
C2
C15
C18
P12
A
B
C
D
E
F
G
H
I
K
L
M

Block Diagram Step Motor PCB

614.122 revision 00


FUNCTION, LOGIC
SIGNAL
PIN
P12
LOGIC VOLTAGE SUPPLY
+5VDC 2a,b,c +5V
GND_5V 1a,b,c
GND_5V 8a,b,c
USED FOR STEPPER MOTOR PHASE CURRENT REFERENCE (D/A CONVERTER)
+15VDC 3a,b,c +15V
GND_15V 4a,b,c (GND 15V)
STEPPER MOTOR POWER SUPPLY
+35VDC 6a,b,c +35V
GND_35V 7a,b,c GND_35V
LOGIC VOLTAGE SUPPLY
+5VDC 31a,b,c +5V
GND_5V 32a,b,c
GND_5V 18b,c
ANTHOS OFF A, B, C, D = "1"
A_SM 27a
B_SM 27b
C_SM 28a
D_SM 28b
ANTHOS MODE PORT = "0"
_ANTH_HAM_SM 16b
THE TWO HALL EFFECT SENSORS IN QUADRATURE ALLOW DIRECTION SENSING AND COUNTING OF EVERY FULL STEP
SA_SM 30a
SB_SM 30b
CLK SIGNAL = 2.666MHz
CLK_HP 20b
_CS2_HP_SM 18a
_SEL
_OE
HCTL
uP
HIGH
LOW
LOW
HIGH
INT_HP_SM 19b
THE CONTENTS OF THE 16 BIT POSITION LATCH MAY BE READ IN 2 SEQUENTIAL BYTES
ONE TURN OF THE ESCAP PP520 MOTOR CAUSES 100 INTERRUPT PULSES. THE PP520 HAS 100 STEPS/TURN
COMMAND AND STEPPER MOTOR BIT-PATTERN FROM uP TO PORT
STEPPER MOTOR CURRENT FROM uP TO D/A CONVERTER
COUNTER-OUTPUTS TO uP
PERIPHERY STATE (OS, HS) FROM PORT A TO uP
AD0 9a
AD1 9c
AD2 10a
AD3 10c
AD4 11a
AD5 11c
AD6 12a
AD7 12c
WRITE PULSE >407ns LOW
READ PULSE >432ns LOW
CHIP SELECT >625ns LOW
POWER UP RESET:
- CLEARS THE CONTROL REGISTER AND PORTS ARE SET IN TRI-STATE
- DAC OUTPUT WILL GO TO 0V
- ENDSTAGE IS DISABLED
_WR 15c
_RD 15a
_CS1_82C55_SM 17c
RESET 16c
PERIPHERY SENSORS (OS, HS)
SENSOR0_SM 23a
SENSOR1_SM 23b
SENSOR2_SM 24a
SENSOR3_SM 24b
SENSOR4_SM 25a
SENSOR5_SM 25b
SENSOR6_SM 26a
SENSOR7_SM 26b
MICRO STEP FREQUENCY FOR EACH STEPPER MOTOR (SE1, SM2, SM3)
LOW PULSE 20us
_CLK2_SM 21a
_CLK1_SM 21b
_CLK0_SM 22a
MEMORY ADDRESS
-CHIP SELECT OF DAC
-RESET COUNTER
MA0 13a
MA1 13c
MA2 14a
CHIP SELECT, >625ns LOW
_CS0_HC138_SM 17a
INPUT BUFFER
A_INV
B_INV
C_INV
D_INV
_ANTH_HAM
SA
SB
-COMMUTATION LOGIC
-SWITCH LOGIC:
AUTOCOMMUTATION <-> MICROSTEP
-SWITCH LOGIC:
mP ANTHOS <-> mP HAMILTON
EN_INV_SE1
PHA_N_SE1
PHA_P_SE1
PHB_N_SE1
PHB_P_SE1
G A L
20V8
_RD
MA0
_RST_HP
CLK
_OE
_SEL
_RST
CNT_DCDR
D0...D7
COUNTER
HCTL 2020 HP
ENDSTAGE 1 -> CONTROLLED MICROSTEPPING MODE
-> AUTOCOMMUTATION MODE
ENDSTAGE 1 -> MICROSTEPPING MODE
SINUSOIDAL, 16 MICROSTEPS
FULL, HALF STEP AND 4,8,16 MICROSTEPS
_RESET
D0...D7
_CS_SE1_A
_CS
_LDAC
_RST
D0...D7
D / A
CONVERTER
7224
PHASE A
VOUT
VREF
PHASE B
VREF
VOUT
_CS_SE1_B
VREF 5V
LM336
CHOPPER
FREQUENCY
IN1
IN2
EN
LOGIC
OUT1
OUT2
REF1
VSENSE1
R_C
OSC
CURRENT
CONTROLLER
L6506
REF2
VSENSE2
IN3
IN4
OUT3
OUT4
+35V
L6202 SGS
V_S
EN
BRIDGE LOGIC
SENSE
GND_35V
IN2
IN1
FULL BRIDGE
DRIVER
28c 1PHA-_SM
27c 1PHA+_SM
30c 1PHB-_SM
29c 1PHB+_SM
SE1
I/O
PORT
82C55A-2
P O R T C
INPUT
OUTPUT
_D_U
SA_MP
SB_MP
_POS
_CW_CCW
_AC_MS
_EN_SE1
PHA_SE1
PHB_SE1
LATCH
SE1
ADDRESS/DATA
BUS
D0...D7
MA0
MA1
CONTROL SIGNALS
P O R T B O U T P U T
_EN_SM2
PHA_SM2
PHB_SM2
LATCH
SM2
P O R T A
INPUT
_EN_SM3
PHA_SM3
PHB_SM3
LATCH
SM3
_CS_SM2_A
_CS_SM2_B
ENDSTAGE 2 -> MICROSTEPPING MODE
SINUSOIDAL, 16 MICROSTEPS
FULL, HALF STEP AND 4,8,16 MICROSTEPS
24c 2PHA-_SM
23c 2PHA+_SM
26c 2PHB-_SM
25c 2PHB+_SM
SM2
_CS_SM3_A
_CS_SM3_B
ENDSTAGE 3 -> MICROSTEPPING MODE
SINUSOIDAL, 16 MICROSTEPS
FULL, HALF STEP AND 4,8,16 MICROSTEPS
20c 3PHA-_SM
19c 3PHA+_SM
22c 3PHB-_SM
21c 3PHB+_SM
SM3
DECODER
A
B
C
_CS_SE1_A
_CS_SE1_B
_CS_SM2_A
_CS_SM2_B
_CS_SM3_A
_CS_SM3_B
_RST_HP
D / A
CONVERTERS
7224
COUNTER
_WR
_G2B
_G2A
74HC138

CLOSE LOOP SOLUTION (SE1):

A ESCAP PP520 DISC MAGNET MOTOR IS UTILIZED. IT IS CONSTRUCTED WITH TWO INTEGRAL HALL EFFECT SENSORS.

IN THIS CASE BOTH ENCODER'S SIGNALS WILL BE USED FOR TWO DIFFERENTS REQUIREMENTS:
- AUTOCOMMUTATION OF THE MOTOR (LOGIC SEQUENCER -> GAL)
- POSITION FEEDBACK (IN CONJUNCTION WITH THE HP-COUNTER)

OPEN LOOP SOLUTION (SM2, SM3):

A STEPPER MOTOR IS USED, WHICH DOESN'T REQUIRE A FEEDBACK TRANSDUCER.

IT IS A POSITIONIG SYSTEM BY ITSELF.

2.7.5 Entry PCB p/n 146 176

FUNCTIONAL DESCRIPTION

Overview

The entry PCB is driven by the microprocessor PCB of the entry system. The entry PCB provides the functions to operate the sensors and activators of the entry-stack assembly.

There are three different groups of functions:

- ❒ Operation of stepper motor SM40 (Entry Stack Lift).
- ❒ Operation of the transmitter and signal processing for the MTP - detector OS42 (checks if MTP is in the entry stack).
- ❒ Operation of additional sensors and activators, namely:

  1 light barrier (OS40 main initialization entry stack).

  1 light barrier (OS41 entry stack position).

  1 load button (MS43) including debounce and interrupt generation.

  1 driver for operation of LED, OS40, and OS41.

  Operates signal lamps: green (LG53) or yellow (LY54).

Stepper Motor Operation

Stepper motor operation is in accordance with the conception and the production of the stepper motor PCB P/N 146174. One stepper motor can be driven in the micro step mode (SM40, entry-stack lift).

Stepper motor operation involves the following components:

- ❒ I/O - port 82C55A-2:

  - PB2, PB3, and PB4 for stepper motor SM40

- ❒ 2 stepper motor end stages, each involves 2 D/A - converters (PM7224), 2 “full bridge drivers” L6202, and a “current controller” L6506
- ❒ Latch 74HC75 to synchronize the I/O port 82C55A-2 with the D/A - converters (Synchronization of the phase polarity with the phase-current intensity)

MTP Detector

The MTP-detector portion of the entry PCB provides functions that allow detection of MTPs in the entry stack. The conception and realization of the MTP detector is the same as that for the incubator PCB P/N 146178. The detection of an MTP occurs when the beam of light transmitted over a transmitter-receiver is broken. The signal source develops a square-wave signal with a duty-cycle of 50% and a frequency of 15.625kHz (PWM-frequency of the 80C196-processor, P2.5/PWM0). The square-wave signal is converted into a sine-wave transmission signal by a low-pass filter. The detector output of the tone-decoder LM 567 CN changes its logical condition depending on the signal- amplitude of the received signals. It is sent to the PA7 port (MTP_OS) of the I/O -IC 82C55-2. The status of the sensors may be asked after a delay-time of 50 ms. A change in the detection threshold or the quantitative seizure of the reception signal is made possible through a controlled amplifier (combination OP-Amp and D/A - converter PM7524), through which a selectable part of the transmission signal is added to the reception signal. This compensation signal is phase locked to the transmission signal.

With the port PB6 (_MEASURE_ADJUST_MTP_OS) the sensor mode is determined.

The transmitter (signal formation and driver) and the receiver (amplifier, signal filter, and adder for the compensating signal) are independently integrated onto the exit PCB. Both the LED (OS42) and the photo-transistor (OS42) are fitted onto the E10, and E9 connectors. The detection of MTP presence in the entry stack is only possible when the PB7 port of the 82C55A-2 (OS42) is set on “high”. The MTP detector is switched on and off with the PB5 port (_ON_OFF_MTP_OS).

Additional Sensors and Activators

Altogether, 2 sensors with logical outputs are read over ports PA2 and the PA3 of the I/O - IC 82C55A-2. Besides the optical switch OS41 (entry-stack position), the initialization sensor OS40 (entry stack) is additionally processed. The debounced load button signal (MS43) is sent as an interrupt-signal to the HSI.1 port. This signal is also sent to the PA6 port of the I/O - IC.

Additionally, two drivers are available for the operation of LEDs. One of which (port Q1 of the latch - IC 74HC273) is controlled by optical switch OS41.

The remaining two drivers are used for turning the signal lamps (LG43 and LY44) on and off. The light intensity of the respective lamps are regulated with the pulse-width-modulators, P1.3/PWM1 for the green signal lamp and P1.4/PWM2 for the yellow signal lamp. The puls frequency of both operations is 15.625 kHz. The amount of time for switching on the signal lamps may not be more than 30% (PWM value: 0...77) for green lamps, and 40% (PWM value: 0...102) for yellow lamps. The blinker frequencies for the green and yellow signal lamps may be regulated (default: blinker frequency = 2Hz).

Signaling of the signal lamps:

Constant green: hand manipulation allowed

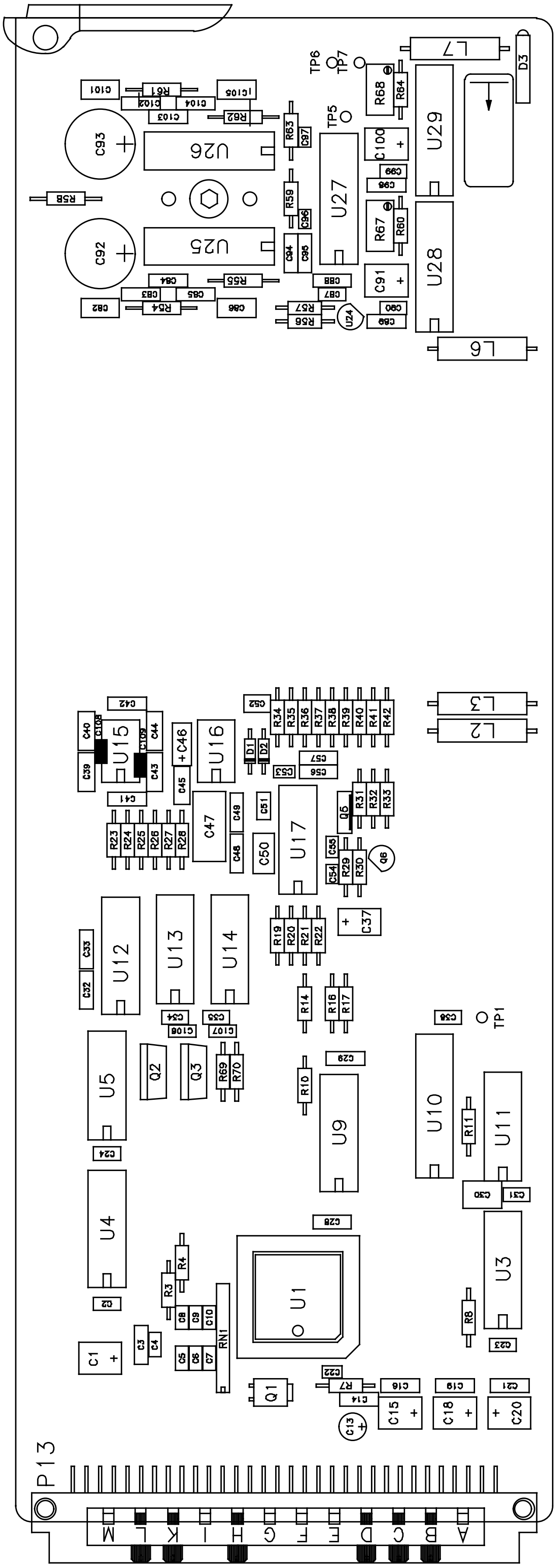
Constant yellow: operation is waiting

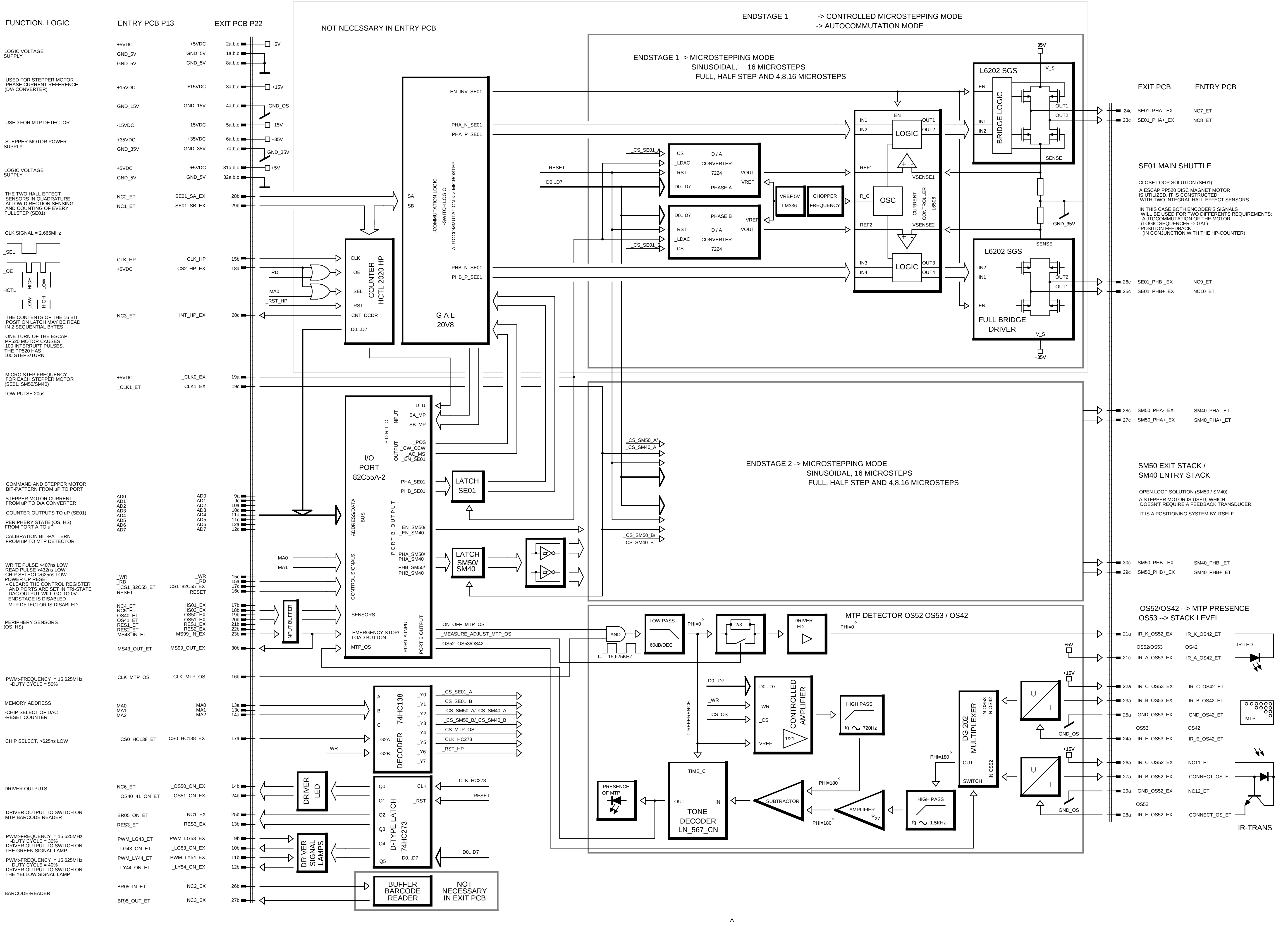
Blinking yellow: operation in progress

Refer to the drawings on the following pages:

- ❐ Entry PCB (component layout): Dwg No. 146 176
- ❐ Exit / Entry PCB (block diagram): Dwg No. 614 128

Entry PCB (component layout): Dwg No. 146 176 revision 03


L7
D3
TP6
TP7
R68
R64
C101
R61
C102
C104
C105
C103
R62
R63
C97
TP5
C93
U26
U29
C100
C99
R58
C98
R59
C96
U27
R67
R60
C92
U25
C94
C95
U28
C91
C84
R55
C88
C83
C85
C87
C82
R54
C86
R57
U24
C90
R56
C89
L6
C42
C52
R34
R35
R36
R37
R38
R39
R40
R41
R42
L3
L2
C40
C108
U15
C109
C44
C46
U16
D1
D2
C57
C39
C43
C45
C53
C56
C41
Q5
R31
R32
R33
C47
C49
C51
U17
R23
R24
R25
R26
R27
R28
C48
C50
C55
R29
R30
Q6
C54
C33
U12
U13
U14
R19
R20
R21
R22
C37
C32
R14
R16
R17
C34
C35
C106
C107
C38
TP1
U5
Q2
Q3
R69
R70
R10
C29
U10
U9
R11
U11
C24
C30
C31
U4
C28
R4
R3
U1
U3
C2
C8
C9
C10
RN1
R8
C3
C4
C23
C1
C5
C6
C7
C22
R7
C16
C19
C21
Q1
C14
C15
C18
C20
C13
P13
M
L
K
I
H
G
F
E
D
C
B
A


FUNCTION, LOGIC
ENTRY PCB P13
EXIT PCB P22
LOGIC VOLTAGE SUPPLY
+5VDC +5VDC 2a,b,c +5V
GND_5V GND_5V 1a,b,c
GND_5V GND_5V 8a,b,c
USED FOR STEPPER MOTOR PHASE CURRENT REFERENCE (D/A CONVERTER)
+15VDC +15VDC 3a,b,c +15V
GND_15V GND_15V 4a,b,c GND_OS
USED FOR MTP DETECTOR
-15VDC -15VDC 5a,b,c -15V
STEPPER MOTOR POWER SUPPLY
+35VDC +35VDC 6a,b,c +35V
GND_35V GND_35V 7a,b,c GND_35V
LOGIC VOLTAGE SUPPLY
+5VDC +5VDC 31a,b,c +5V
GND_5V GND_5V 32a,b,c
THE TWO HALL EFFECT SENSORS IN QUADRATURE ALLOW DIRECTION SENSING AND COUNTING OF EVERY FULLSTEP (SE01)
NC2_ET SE01_SA_EX 28b
NC1_ET SE01_SB_EX 29b
CLK SIGNAL = 2.666MHz
_SEL
_OE
HCTL
HIGH LOW
LOW HIGH
CLK_HP CLK_HP 15b
+5VDC _CS2_HP_EX 18a
_RD
_MA0
_RST_HP
THE CONTENTS OF THE 16 BIT POSITION LATCH MAY BE READ IN 2 SEQUENTIAL BYTES
ONE TURN OF THE ESCAP PP520 MOTOR CAUSES 100 INTERRUPT PULSES. THE PP520 HAS 100 STEPS/TURN
NC3_ET INT_HP_EX 20c
MICRO STEP FREQUENCY FOR EACH STEPPER MOTOR (SE01, SM50/SM40)
LOW PULSE 20us
+5VDC _CLK0_EX 19a
_CLK1_ET _CLK1_EX 19c
COMMAND AND STEPPER MOTOR BIT-PATTERN FROM uP TO PORT
STEPPER MOTOR CURRENT FROM uP TO D/A CONVERTER
COUNTER-OUTPUTS TO uP (SE01)
PERIPHERY STATE (OS, HS) FROM PORT A TO uP
CALIBRATION BIT-PATTERN FROM uP TO MTP DETECTOR
AD0 AD0 9a
AD1 AD1 9c
AD2 AD2 10a
AD3 AD3 10c
AD4 AD4 11a
AD5 AD5 11c
AD6 AD6 12a
AD7 AD7 12c
WRITE PULSE >407ns LOW
READ PULSE >432ns LOW
CHIP SELECT >625ns LOW
POWER UP RESET:
- CLEARS THE CONTROL REGISTER AND PORTS ARE SET IN TRI-STATE
- DAC OUTPUT WILL GO TO 0V
- ENDSTAGE IS DISABLED
- MTP DETECTOR IS DISABLED
_WR _WR 15c
_RD _RD 15a
_CS1_82C55_ET _CS1_82C55_EX 17c
RESET RESET 16c
PERIPHERY SENSORS (OS, HS)
NC4_ET HS01_EX 17b
NC5_ET HS03_EX 18b
OS40_ET OS50_EX 19b
OS41_ET OS51_EX 20b
RES1_ET RES1_EX 21b
RES2_ET RES2_EX 22b
MS43_IN_ET MS99_IN_EX 23b
MS43_OUT_ET MS99_OUT_EX 30b
PWM:-FREQUENCY = 15.625MHz -DUTY CYCLE = 50%
CLK_MTP_OS CLK_MTP_OS 16b
MEMORY ADDRESS
-CHIP SELECT OF DAC
-RESET COUNTER
MA0 MA0 13a
MA1 MA1 13c
MA2 MA2 14a
CHIP SELECT, >625ns LOW
_CS0_HC138_ET _CS0_HC138_EX 17a
DRIVER OUTPUTS
NC6_ET _OS50_ON_EX 14b
_OS40_41_ON_ET _OS51_ON_EX 24b
DRIVER OUTPUT TO SWITCH ON MTP BARCODE READER
BR05_ON_ET NC1_EX 25b
RES3_ET RES3_EX 13b
PWM:-FREQUENCY = 15.625MHz -DUTY CYCLE = 30% DRIVER OUTPUT TO SWITCH ON THE GREEN SIGNAL LAMP
PWM_LG43_ET PWM_LG53_EX 9b
_LG43_ON_ET _LG53_ON_EX 10b
PWM:-FREQUENCY = 15.625MHz -DUTY CYCLE = 40% DRIVER OUTPUT TO SWITCH ON THE YELLOW SIGNAL LAMP
PWM_LY44_ET PWM_LY54_EX 11b
_LY44_ON_ET _LY54_ON_EX 12b
BARCODE-READER
BR05_IN_ET NC2_EX 26b
BR)5_OUT_ET NC3_EX 27b
NOT NECESSARY IN ENTRY PCB
COUNTER HCTL 2020 HP
CLK _OE _SEL _RST CNT_DCDR D0...D7
SA SB
EN_INV_SE01 PHA_N_SE01 PHA_P_SE01 PHB_N_SE01 PHB_P_SE01
-COMMUTATION LOGIC: -SWITCH LOGIC: AUTOCOMMUTATION <-> MICROSTEP
GAL 20V8
I/O PORT 82C55A-2
PORT C INPUT _D_U SA_MP SB_MP
OUTPUT _POS _CW_CCW _AC_MS _EN_SE01
PHA_SE01 PHB_SE01
LATCH SE01
ADDRESS/DATA BUS
PORT B OUTPUT _EN_SM50/ _EN_SM40 PHA_SM50/ PHA_SM40 PHB_SM50/ PHB_SM40
LATCH SM50/ SM40
MA0 MA1
CONTROL SIGNALS
SENSORS
INPUT BUFFER
EMERGENCY STOP/ LOAD BUTTON
MTP_OS
PORT A INPUT
PORT B OUTPUT
_ON_OFF_MTP_OS
_MEASURE_ADJUST_MTP_OS
_OS52_OS53/OS42
ENDSTAGE 1 -> CONTROLLED MICROSTEPPING MODE -> AUTOCOMMUTATION MODE
ENDSTAGE 1 -> MICROSTEPPING MODE SINUSOIDAL, 16 MICROSTEPS FULL, HALF STEP AND 4,8,16 MICROSTEPS
_CS_SE01_A
_RESET
D0...D7
_CS _LDAC _RST D0...D7 D / A CONVERTER 7224 PHASE A VOUT VREF
D0...D7 PHASE B _RST _LDAC _CS D / A CONVERTER 7224 VREF VOUT
_CS_SE01_B
VREF 5V LM336
CHOPPER FREQUENCY
IN1 IN2 EN LOGIC OUT1 OUT2 REF1 VSENSE1 R_C OSC CURRENT CONTROLLER L6506 REF2 VSENSE2 IN3 IN4 LOGIC OUT3 OUT4
+35V
L6202 SGS V_S EN IN1 IN2 BRIDGE LOGIC OUT1 OUT2 SENSE
GND_35V
L6202 SGS SENSE IN2 IN1 EN OUT2 OUT1 FULL BRIDGE DRIVER V_S
+35V
EXIT PCB ENTRY PCB
24c SE01_PHA-_EX NC7_ET
23c SE01_PHA+_EX NC8_ET
SE01 MAIN SHUTTLE
CLOSE LOOP SOLUTION (SE01):
A ESCAP PP520 DISC MAGNET MOTOR IS UTILIZED. IT IS CONSTRUCTED WITH TWO INTEGRAL HALL EFFECT SENSORS.
IN THIS CASE BOTH ENCODER'S SIGNALS WILL BE USED FOR TWO DIFFERENTS REQUIREMENTS:
- AUTOCOMMUTATION OF THE MOTOR (LOGIC SEQUENCER -> GAL)
- POSITION FEEDBACK (IN CONJUNCTION WITH THE HP-COUNTER)
26c SE01_PHB-_EX NC9_ET
25c SE01_PHB+_EX NC10_ET
_CS_SM50_A/ _CS_SM40_A
ENDSTAGE 2 -> MICROSTEPPING MODE SINUSOIDAL, 16 MICROSTEPS FULL, HALF STEP AND 4,8,16 MICROSTEPS
_CS_SM50_B/ _CS_SM40_B
28c SM50_PHA-_EX SM40_PHA-_ET
27c SM50_PHA+_EX SM40_PHA+_ET
SM50 EXIT STACK / SM40 ENTRY STACK
OPEN LOOP SOLUTION (SM50 / SM40):
A STEPPER MOTOR IS USED, WHICH DOESN'T REQUIRE A FEEDBACK TRANSDUCER.
IT IS A POSITIONING SYSTEM BY ITSELF.
30c SM50_PHB-_EX SM40_PHB-_ET
29c SM50_PHB+_EX SM40_PHB+_ET
MTP DETECTOR OS52 OS53 / OS42
AND
f= 15,625KHZ
LOW PASS 60dB/DEC
PHI=0°
2/3
DRIVER LED
PHI=0°
D0...D7 _WR _CS_OS
f_REFERENCE
D0...D7 _WR _CS VREF CONTROLLED AMPLIFIER 1/21
HIGH PASS fg 720Hz
DG 202 MULTIPLEXER IN OS53 IN OS42 OUT IN OS52 SWITCH
PHI=180°
TIME_C OUT IN TONE DECODER LN_567_CN
PRESENCE OF MTP
SUBTRACTOR
PHI=180°
AMPLIFIER *27
PHI=180°
HIGH PASS fg 1.5KHz
U I
+5V +15V GND_OS
OS52/OS42 --> MTP PRESENCE
OS53 --> STACK LEVEL
21a IR_K_OS52_EX IR_K_OS42_ET
OS52/OS53 OS42
21c IR_A_OS53_EX IR_A_OS42_ET
IR-LED
22a IR_C_OS53_EX IR_C_OS42_ET
23a IR_B_OS53_EX IR_B_OS42_ET
25a GND_OS53_EX GND_OS42_ET
MTP
OS53 OS42
24a IR_E_OS53_EX IR_E_OS42_ET
26a IR_C_OS52_EX NC11_ET
27a IR_B_OS52_EX CONNECT_OS_ET
29a GND_OS52_EX NC12_ET
OS52
28a IR_E_OS52_EX CONNECT_OS_ET
IR-TRANS
DECODER 74HC138 A B C _G2A _G2B _Y0 _Y1 _Y2 _Y3 _Y4 _Y5 _Y6 _Y7
_WR
_CS_SE01_A _CS_SE01_B _CS_SM50_A/_CS_SM40_A _CS_SM50_B/_CS_SM40_B _CS_MTP_OS _CLK_HC273 _RST_HP
DRIVER LED
D-TYPE LATCH 74HC273 Q0 Q1 Q2 Q3 Q4 Q5 CLK _RST D0...D7
_CLK_HC273 _RESET D0...D7
DRIVER SIGNAL LAMPS
BUFFER BARCODE READER
NOT NECESSARY IN EXIT PCB

Block Diagram Exit / Entry PCB

614.128 revision 00

2.7.6 Incubator PCB p/n 146 178

Hardware

The incubator PCB controls the front and rear tower temperature. The output of the temperature sensors and the true RMS heating voltage are switched to a 12-Bit ADC via a sensor multiplexer. The power of the ten heating elements is also sequentially set via a heating multiplexer. A discrete type PID-regulator controls the temperature. A watchdog supervises the temperature regulation CPU.

The performance of the ventilators for accurate incubator cooling is controlled by the software.

The MTP-sensor is also placed on the incubator PCB.

Hardware functions

- ❐ Measurement of incubator temperature
- ❐ Control of incubator chamber heating power
- ❐ Measurement of heating voltage (RMS value)
- ❐ Watchdog for temperature regulation CPU
- ❐ Control of incubator ventilators
- ❐ MTP-sensor

Front and rear tower temperature control

Sensor-MUX

The 13 temperature sensors, the 2 reference resistors and the RMS voltage are measured with the 12-bit-ADC. The switching of the individual sources is carried out by the 16-channel JFET multiplexer MUX-16. The MUX is addressed via port PB 0…3 of the 82C55.

Measurement of heating voltage (RMS value)

Since the heating voltage is not regulated and the heating power strongly depends on it, the RMS voltage must be determined and taken into consideration when calculating the mark-space ratio ($P = V_{RMS}^2 / R_{heating}$).

Temperature measurement

The incubator slot temperature is measured with a precision NTC device which, in the range of 0° - 70°, has a accuracy of ±0.2° C (i.e. a thermistor). The sensors therefore do not have to be adjusted individually.

A constant current of 262 µA flows through the NTC and the voltage drop across the NTC is measured with a 12-bit ADC. See also Incubator PCB (block diagram) dwg 614 124.

Temperature measurement calibration

The temperature measurement calibration is carried out by the software. Two reference resistors simulate an NTC at 15° C and at 70° C. The required offset and the gain can be determined from these two references.

Calculation of heating performance

A defined heating performance results from the control algorithm. An optimal heating voltage results from the RMS voltage and the heating element resistance.

PWD

The heating power is determined by pulse width modulation. The pulse width modulation is done by analogue means. The mark-space ratio is derived from the set nominal value.

Watchdog

The watchdog supervises the temperature regulation CPU. With each temperature regulation task the bit PC3 of the PIA 82C55 must be logically inverted. If bit PC3 is not inverted within 2 minutes, the pulse width modulator is disabled and all slot heaters switched off.

Safety measures for incubator slot temperature limitation

Various independent safety measures have been implemented in the hardware to supervise the incubator slot temperature:

- A watchdog supervises the temperature regulation CPU.
- Each incubator slot is equipped with a bimetallic switch connected in series with the heating element. Overheating of an incubator slot is therefore made impossible by hardware means.
- In order to protect the circuits and the semiconductor devices, heating circuits are protected in pairs by a multi-fuse semiconductor protection device. The fuses are on the Power Supply 1 PCB.

Control of front and rear tower ventilator

The incubators are ventilated individually to minimize the heating power and therefore to save energy and also to reduce the noise level.

The ventilators are controlled via 4-bit-DAC’s allowing 16 stage speed variation.

MTP sensor

The MTP sensor needs a square wave signal with a duty-cycle of 1:1. The control is dimensioned according to the PWM-frequency of the 80C196 processor (15.625 kHz). It is activated via port PC0 of the PIA 82C55 (_on.off). The sensor status can be requested via port PC4 of the 82C55 after a delay of 50 ms (plate present). The sensor mode is defined with port PC1 (_measurement/adjustment).

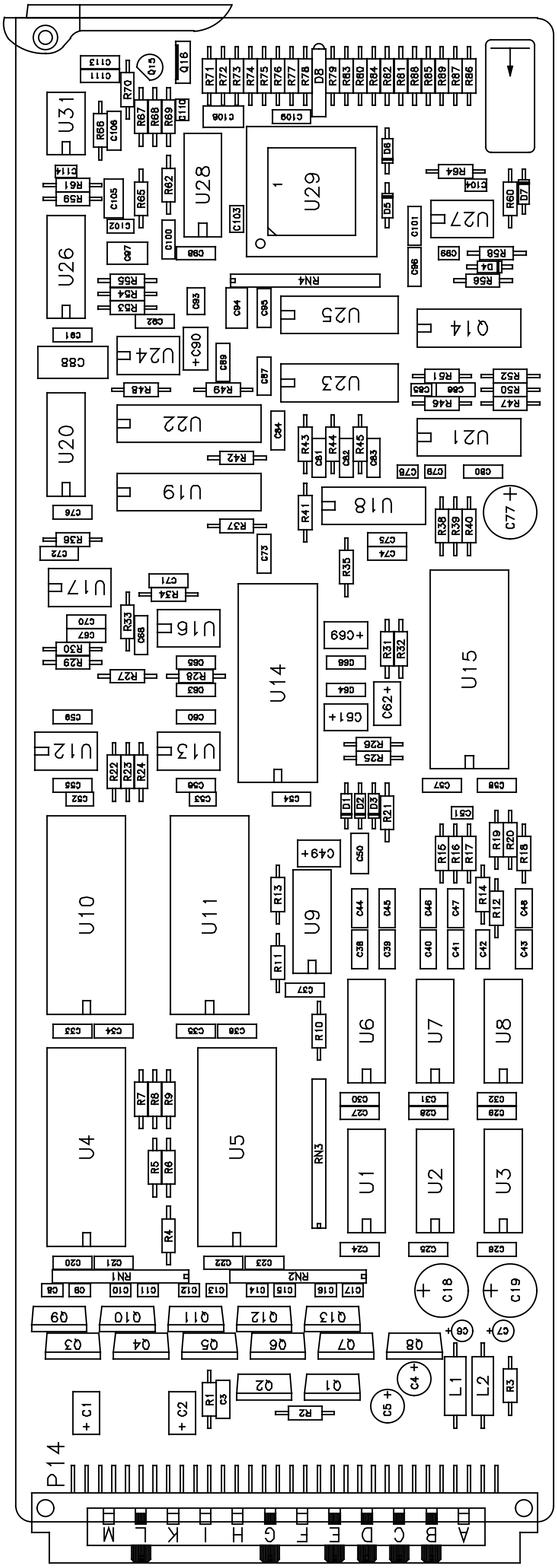
See also dwg 614 143 (section 2.2.3).

Calibration of MTP sensor

Optical components are liable to large tolerances and ageing and it is difficult to exactly adjust the optical axis. The sensor must therefore be calibrated.

The calibration is carried out automatically with each init through an 8-bit-DAC, adjusting the sensor sensitivity.

Incubator PCB (Component Layout): Dwg No. 146 178 revision 04


U31
U28
U29
U27
U26
U25
Q14
U24
U23
U22
U21
U20
U19
U18
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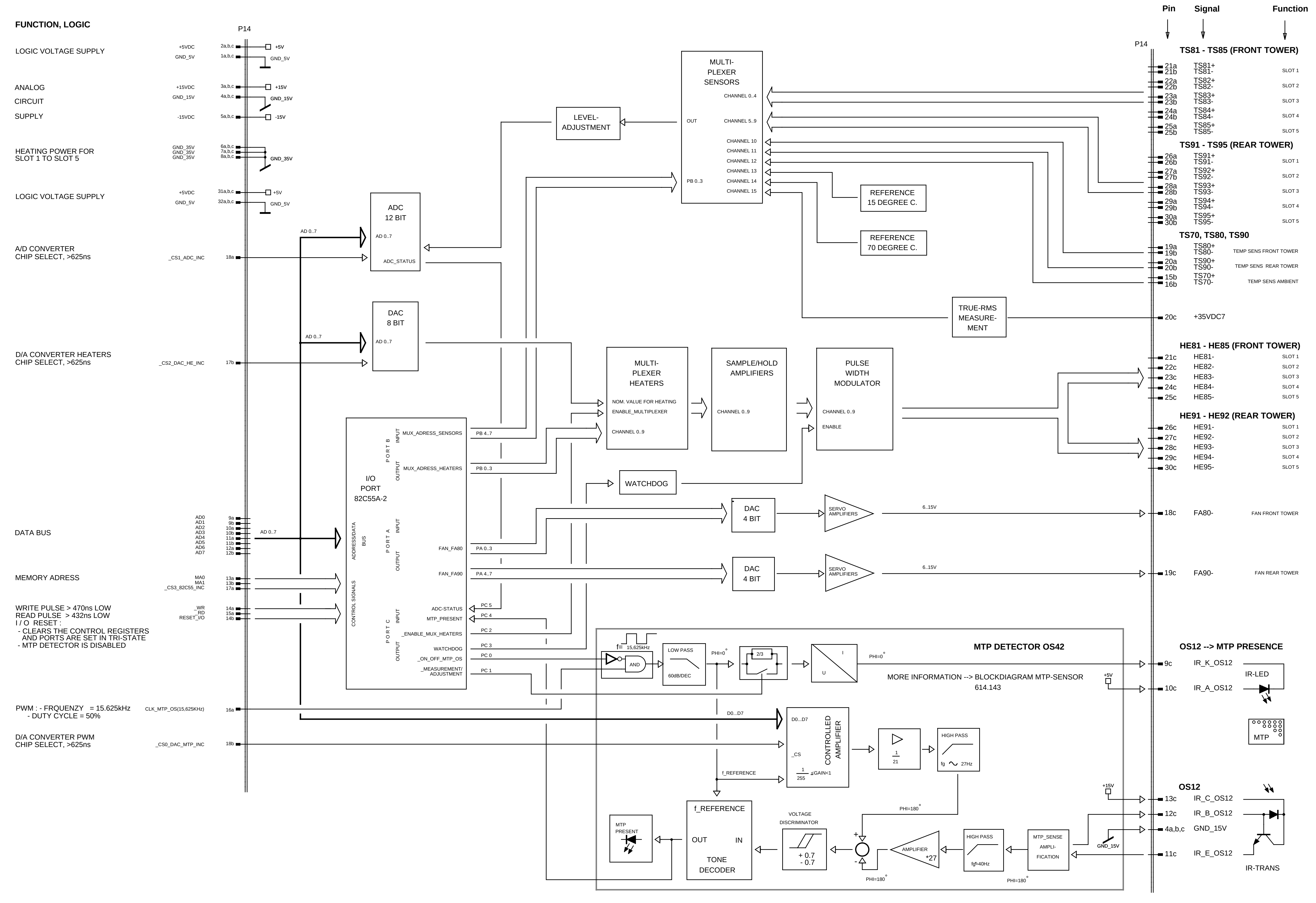
U16
U14
U15
U12
U13
U10
U11
U9
U6
U7
U8
U4
U5
RN3
U1
U2
U3
RN1
RN2
Q9
Q10
Q11
Q12
Q13
Q3
Q4
Q5
Q6
Q7
Q8
Q2
Q1
C18
C19
C1
C2
C4
C5
L1
L2
R3
P14
A
B
C
D
E
F
G
H
I
K
L
M

Refer to the drawing on the following page:

Incubator PCB (block diagram): Dwg No. 614 124

Block Diagram Incubator PCB

614.124 revision 00


FUNCTION, LOGIC
P14
LOGIC VOLTAGE SUPPLY
+5VDC
GND_5V
2a,b,c
1a,b,c
+5V
GND_5V
ANALOG
CIRCUIT
SUPPLY
+15VDC
GND_15V
-15VDC
3a,b,c
4a,b,c
5a,b,c
+15V
GND_15V
-15V
HEATING POWER FOR
SLOT 1 TO SLOT 5
GND_35V
GND_35V
GND_35V
6a,b,c
7a,b,c
8a,b,c
GND_35V
LOGIC VOLTAGE SUPPLY
+5VDC
GND_5V
31a,b,c
32a,b,c
+5V
GND_5V
A/D CONVERTER
CHIP SELECT, >625ns
_CS1_ADC_INC
18a
AD 0..7
ADC
12 BIT
AD 0..7
ADC_STATUS
D/A CONVERTER HEATERS
CHIP SELECT, >625ns
_CS2_DAC_HE_INC
17b
AD 0..7
DAC
8 BIT
AD 0..7
DATA BUS
AD0
AD1
AD2
AD3
AD4
AD5
AD6
AD7
9a
9b
10a
10b
11a
11b
12a
12b
AD 0..7
MEMORY ADRESS
MA0
MA1
_CS3_82C55_INC
13a
13b
17a
WRITE PULSE > 470ns LOW
READ PULSE > 432ns LOW
I / O RESET :
- CLEARS THE CONTROL REGISTERS
AND PORTS ARE SET IN TRI-STATE
- MTP DETECTOR IS DISABLED
_WR
_RD
RESET_I/O
14a
15a
14b
PWM : - FRQUENZY = 15.625kHz
- DUTY CYCLE = 50%
CLK_MTP_OS(15,625KHz)
16a
D/A CONVERTER PWM
CHIP SELECT, >625ns
_CS0_DAC_MTP_INC
18b
I/O
PORT
82C55A-2
ADDRESS/DATA
BUS
CONTROL SIGNALS
PORT B
INPUT
OUTPUT
MUX_ADRESS_SENSORS
PB 4..7
MUX_ADRESS_HEATERS
PB 0..3
PORT A
INPUT
OUTPUT
FAN_FA80
PA 0..3
FAN_FA90
PA 4..7
PORT C
INPUT
OUTPUT
ADC-STATUS
PC 5
MTP_PRESENT
PC 4
_ENABLE_MUX_HEATERS
PC 2
WATCHDOG
PC 3
_ON_OFF_MTP_OS
PC 0
_MEASUREMENT/
ADJUSTMENT
PC 1
LEVEL-
ADJUSTMENT
MULTI-
PLEXER
SENSORS
OUT
PB 0..3
CHANNEL 0..4
CHANNEL 5..9
CHANNEL 10
CHANNEL 11
CHANNEL 12
CHANNEL 13
CHANNEL 14
CHANNEL 15
REFERENCE
15 DEGREE C.
REFERENCE
70 DEGREE C.
TRUE-RMS
MEASURE-
MENT
MULTI-
PLEXER
HEATERS
NOM. VALUE FOR HEATING
ENABLE_MULTIPLEXER
CHANNEL 0..9
SAMPLE/HOLD
AMPLIFIERS
CHANNEL 0..9
PULSE
WIDTH
MODULATOR
CHANNEL 0..9
ENABLE
WATCHDOG
DAC
4 BIT
SERVO
AMPLIFIERS
6..15V
DAC
4 BIT
SERVO
AMPLIFIERS
6..15V
MTP DETECTOR OS42
f= 15,625kHz
AND
LOW PASS
60dB/DEC
PHI=0°
2/3
I
U
PHI=0°
MORE INFORMATION --> BLOCKDIAGRAM MTP-SENSOR
614.143
+5V
D0...D7
D0...D7
_CS
CONTROLLED
AMPLIFIER
1/255 ≤GAIN<1
f_REFERENCE
1/21
HIGH PASS
fg ~ 27Hz
+15V
PHI=180°
f_REFERENCE
OUT
IN
TONE
DECODER
MTP
PRESENT
VOLTAGE
DISCRIMINATOR
+ 0.7
- 0.7
+
-
AMPLIFIER
*27
HIGH PASS
fg=40Hz
MTP_SENSE
AMPLI-
FICATION
GND_15V
PHI=180°
PHI=180°
Pin
Signal
Function
P14
TS81 - TS85 (FRONT TOWER)
21a
21b
TS81+
TS81-
SLOT 1
22a
22b
TS82+
TS82-
SLOT 2
23a
23b
TS83+
TS83-
SLOT 3
24a
24b
TS84+
TS84-
SLOT 4
25a
25b
TS85+
TS85-
SLOT 5
TS91 - TS95 (REAR TOWER)
26a
26b
TS91+
TS91-
SLOT 1
27a
27b
TS92+
TS92-
SLOT 2
28a
28b
TS93+
TS93-
SLOT 3
29a
29b
TS94+
TS94-
SLOT 4
30a
30b
TS95+
TS95-
SLOT 5
TS70, TS80, TS90
19a
19b
TS80+
TS80-
TEMP SENS FRONT TOWER
20a
20b
TS90+
TS90-
TEMP SENS REAR TOWER
15b
16b
TS70+
TS70-
TEMP SENS AMBIENT
20c
+35VDC7
HE81 - HE85 (FRONT TOWER)
21c HE81- SLOT 1
22c HE82- SLOT 2
23c HE83- SLOT 3
24c HE84- SLOT 4
25c HE85- SLOT 5
HE91 - HE92 (REAR TOWER)
26c HE91- SLOT 1
27c HE92- SLOT 2
28c HE93- SLOT 3
29c HE94- SLOT 4
30c HE95- SLOT 5
18c FA80- FAN FRONT TOWER
19c FA90- FAN REAR TOWER
OS12 --> MTP PRESENCE
9c IR_K_OS12
10c IR_A_OS12
IR-LED
MTP
OS12
13c IR_C_OS12
12c IR_B_OS12
4a,b,c GND_15V
11c IR_E_OS12
IR-TRANS

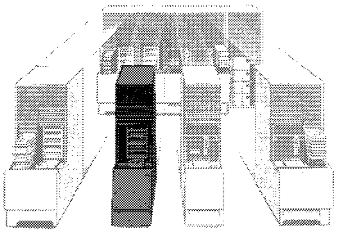
Incubator Module Frame

147 530

I1 | E2 | E5 | E6 | E7 | E13

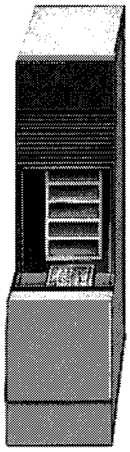
Electronic Rack

(See Entry Module)



Incubator Tower Controlled Temp.

(See Entry Module)



Incubator Tower Lift

(See Entry Module)

Incubator Module Raw

147 788

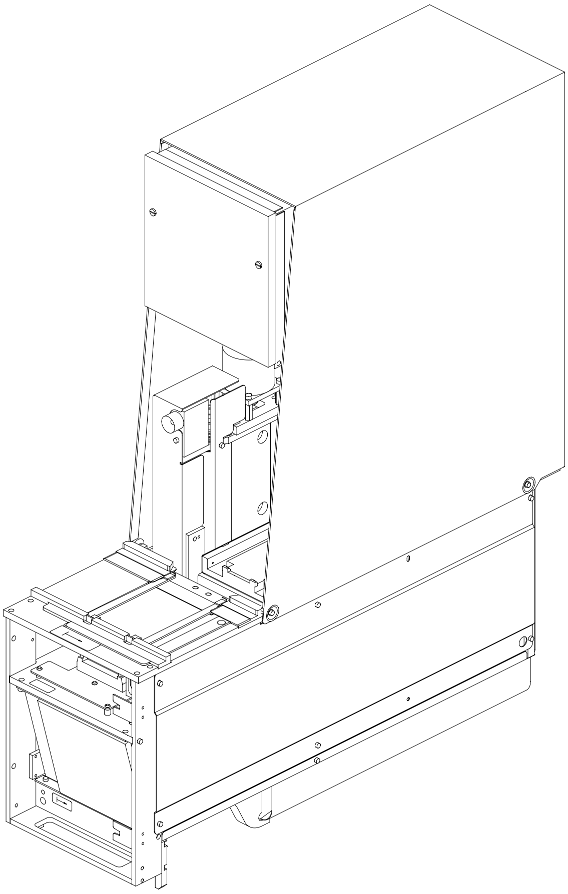
(See next page)

Incubator Module Raw

147 788

- Design
- Functional Description
  - Incubator Module
- Calibration, Adjusting
- Removing Incubator Module
- Removing Assemblies
  - Electronic Rack
- Replacing Spare Parts
- Spare Parts List
- 3D Drawing

CHAPTER 3 INCUBATOR MODULE



3.1 Incubator Module Raw 147 788

3.1.1 Design

Refer to the drawing on the following page:

- ❐ Block Diagram Incubator Module Dwg No. 614 139

Block Diagram Incubator Module 614 139 revision 00 (VD)

Actors:

SE = Stepper-Motor with integrated Encoder
SM = Stepper-Motor
DM = DC-Motor
HE = Heating Element
PM = Pump Motor
LB = LED blue
LG = LED green
LR = LED red
LY = LED yellow
VA = Valve
FA = FAN (Ventilator)

Sensors:

HS = Hall-Switch
OS = Optical-Switch
TS = Temperature Sensor
MS = Micro-Switch
PS = Pressure Sensor
LS = Liquid Level Sensor
BR = Barcode Reader
OT = Over Temperature Switch
AN = Aspirating Needle
DN = Dispensing Needle

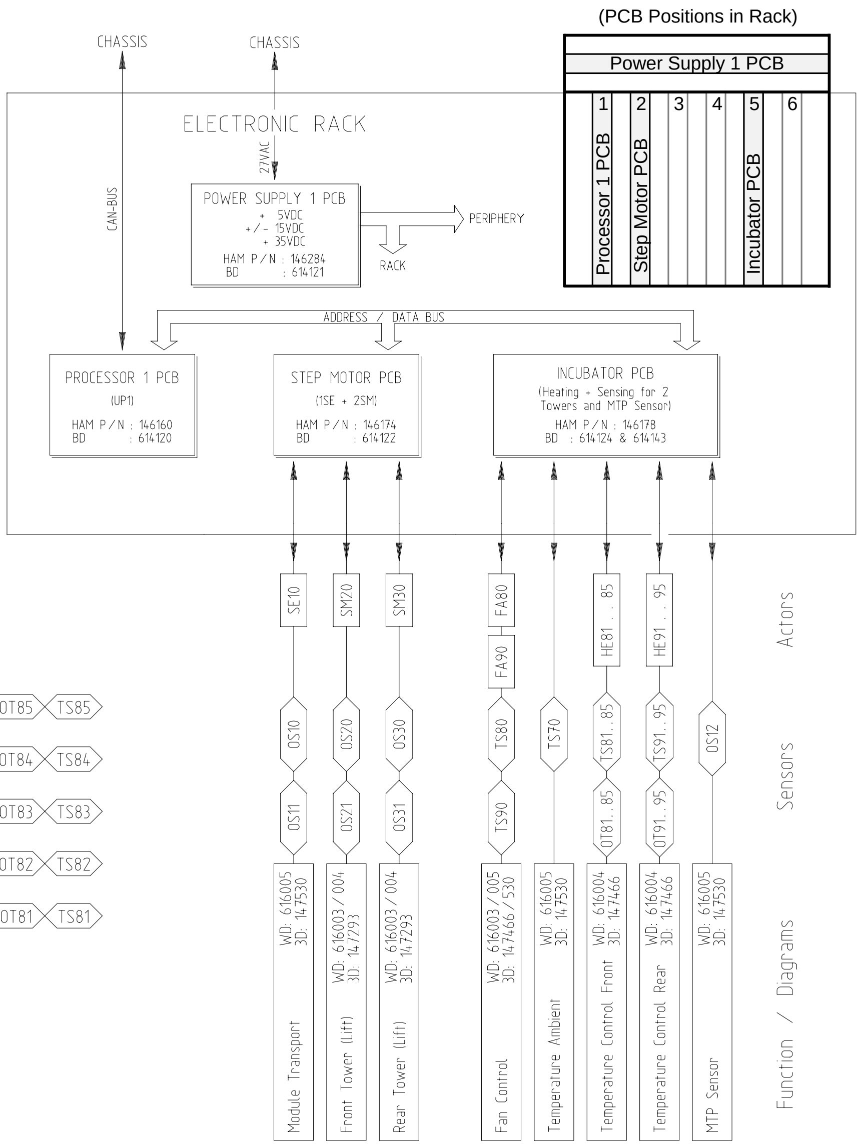
Further Documents for Incubator System:

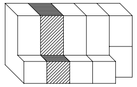
WD: Wiring Diagrams

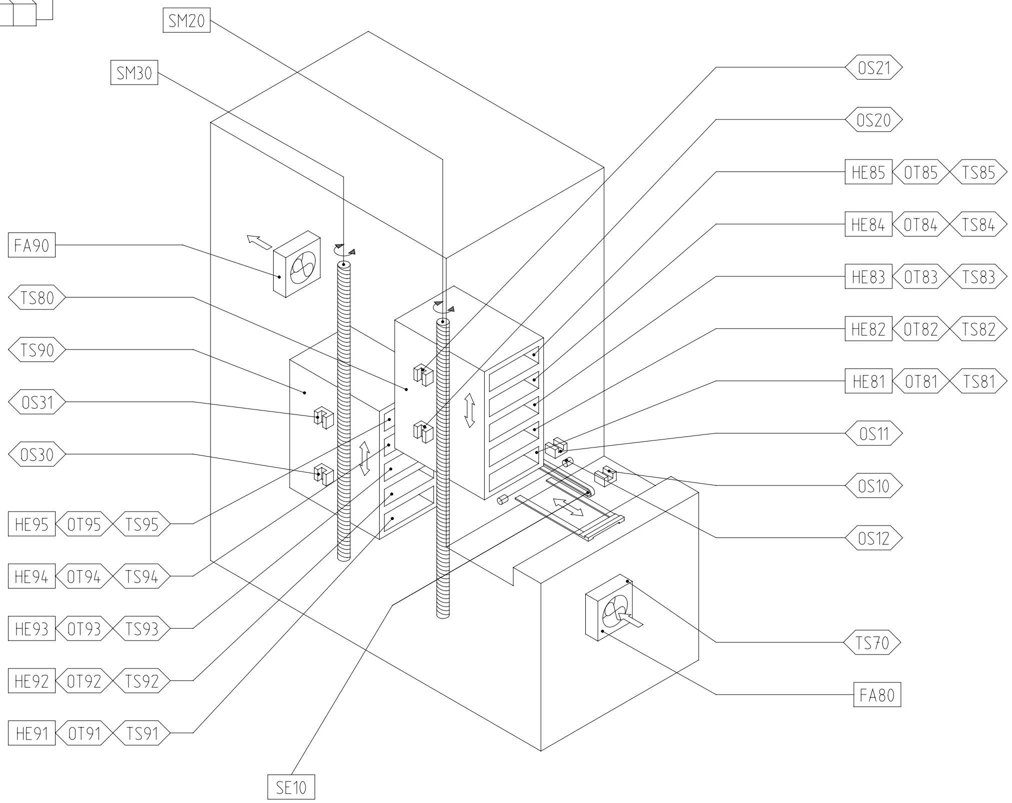
604488 CHASSIS
604498 INCUBATOR MODULE
604796 MOTHERBOARD E PCB
616003 TOWER LIFT
616004 FRONT / REAR-TOWER
616005 MODULE TRANSPORT

3D: 3D Drawings

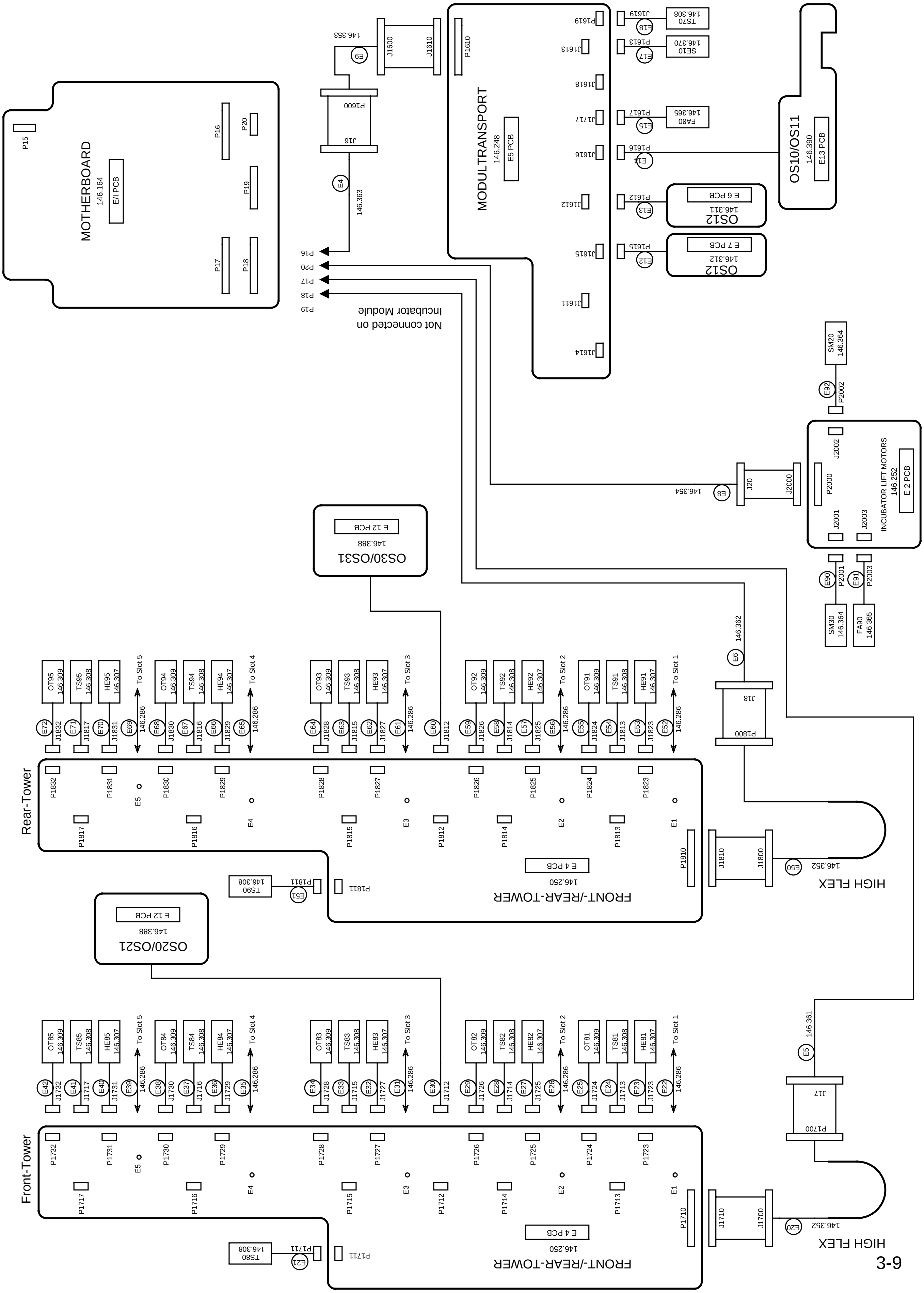
147293 INC. TOWER LIFT
147530 INCUBATOR MODULE FRAME
147466 INC. TOWER-CONTR. TEMP.
147788 INCUBATOR MODULE RAW


(PCB Positions in Rack)
Power Supply 1 PCB
1
2
3
4
5
6
Processor 1 PCB
Step Motor PCB
Incubator PCB
CHASSIS
CHASSIS
ELECTRONIC RACK
27VAC
CAN-BUS
POWER SUPPLY 1 PCB
+ 5VDC
+/- 15VDC
+ 35VDC
HAM P/N : 146284
BD : 614121
PERIPHERY
RACK
ADDRESS / DATA BUS
PROCESSOR 1 PCB
(UP1)
HAM P/N : 146160
BD : 614120
STEP MOTOR PCB
(1SE + 2SM)
HAM P/N : 146174
BD : 614122
INCUBATOR PCB
(Heating + Sensing for 2 Towers and MTP Sensor)
HAM P/N : 146178
BD : 614124 & 614143
SE10
SM20
SM30
FA80
FA90
HE81 . . 85
HE91 . . 95
OS10
OS11
OS20
OS21
OS30
OS31
TS80
TS90
TS70
TS81..85
OT81..85
TS91..95
OT91..95
OS12
WD: 616005 3D: 147530
WD: 616003 / 004 3D: 147293
WD: 616003 / 004 3D: 147293
WD: 616003 / 005 3D: 147466 / 530
WD: 616005 3D: 147530
WD: 616004 3D: 147466
WD: 616004 3D: 147466
WD: 616005 3D: 147530
Module Transport
Front Tower (Lift)
Rear Tower (Lift)
Fan Control
Temperature Ambient
Temperature Control Front
Temperature Control Rear
MTP Sensor
Actors
Sensors
Function / Diagrams




SM20
SM30
FA90
TS80
TS90
OS31
OS30
HE95 OT95 TS95
HE94 OT94 TS94
HE93 OT93 TS93
HE92 OT92 TS92
HE91 OT91 TS91
SE10
OS21
OS20
HE85 OT85 TS85
HE84 OT84 TS84
HE83 OT83 TS83
HE82 OT82 TS82
HE81 OT81 TS81
OS11
OS10
OS12
TS70
FA80

3.1.2 **Wiring Diagram** Inc. Module Raw: Dwg No. 614 498 revision 00


MOTHERBOARD
146.164
E/I PCB
P15
P16
P17
P18
P19
P20
MODULTRANSPORT
146.248
E5 PCB
P1610
J1600
J1610
146.353
E9
P1600
J16
E4
146.363
J1619
J1613
J1618
J1717
J1616
J1612
J1615
J1611
J1614
TS70
146.308
E18
SE10
146.370
E17
FA80
146.365
E15
E14
OS10/OS11
146.390
E13 PCB
OS12
146.311
E 6 PCB
OS12
146.312
E 7 PCB
E13
E12
Not connected on
Incubator Module
SM20
146.364
E92
P2002
J2002
INCUBATOR LIFT MOTORS
146.252
E 2 PCB
P2000
J2000
J20
E8
146.354
J2001
J2003
P2001
P2003
E90
E91
SM30
146.364
FA90
146.365
OS30/OS31
146.388
E 12 PCB
146.362
E6
J18
P1800
Rear-Tower
OT95 146.309
TS95 146.308
HE95 146.307
To Slot 5
OT94 146.309
TS94 146.308
HE94 146.307
To Slot 4
OT93 146.309
TS93 146.308
HE93 146.307
To Slot 3
OT92 146.309
TS92 146.308
HE92 146.307
To Slot 2
OT91 146.309
TS91 146.308
HE91 146.307
To Slot 1
146.286
P1832
P1831
P1830
P1829
P1828
P1827
P1826
P1825
P1824
P1823
P1817
P1816
P1815
P1812
P1814
P1813
P1810
J1810
J1800
E50
146.352
HIGH FLEX
FRONT-/REAR-TOWER
146.250
E 4 PCB
P1811
TS90
146.308
E51
OS20/OS21
146.388
E 12 PCB
146.361
E5
J17
P1700
Front-Tower
OT85 146.309
TS85 146.308
HE85 146.307
OT84 146.309
TS84 146.308
HE84 146.307
OT83 146.309
TS83 146.308
HE83 146.307
OT82 146.309
TS82 146.308
HE82 146.307
OT81 146.309
TS81 146.308
HE81 146.307
P1732
P1731
P1730
P1729
P1728
P1727
P1726
P1725
P1724
P1723
P1717
P1716
P1715
P1712
P1714
P1713
P1710
J1710
J1700
E20
146.352
HIGH FLEX
FRONT-/REAR-TOWER
146.250
E 4 PCB
P1711
TS80
146.308
E21
E1
E2
E3
E4
E5

3.1.3 Functional Description Incubator Module

The Incubator Module contains two temperature controlled incubator towers each with 5 incubation slots. The temperature of both towers is programmable up to 70°C (maximum temperature difference between the two towers: 25°C). One plate can be loaded into each slot. The incubation time for each individual slot may also be defined.

NOTE
All slots within the same incubation tower have the same temperature. They are not individually programmable. However, each slot is individually temperature controlled. Each slot has a booster heater to maintain the required temperature during plate loading (when the door is open).

For further information consult the User Manual section 2.4.

3.1.4 Calibration, Adjusting

3.1.5 Removing Incubator Module

Remove transparent cover, upper front, hardtop, main shuttle rail, cover mains power, and left side front (see section 1.1.5.3.2).

Remove incubator module (see section 1.1.5.3.3).

3.1.6 Removing Assemblies

See Entry Module

3.1.7 Replacing Spare Parts

See Entry Module Chapter

3.1.8 Spare Parts List

Incubator Module Raw 147 788 Revision: 01

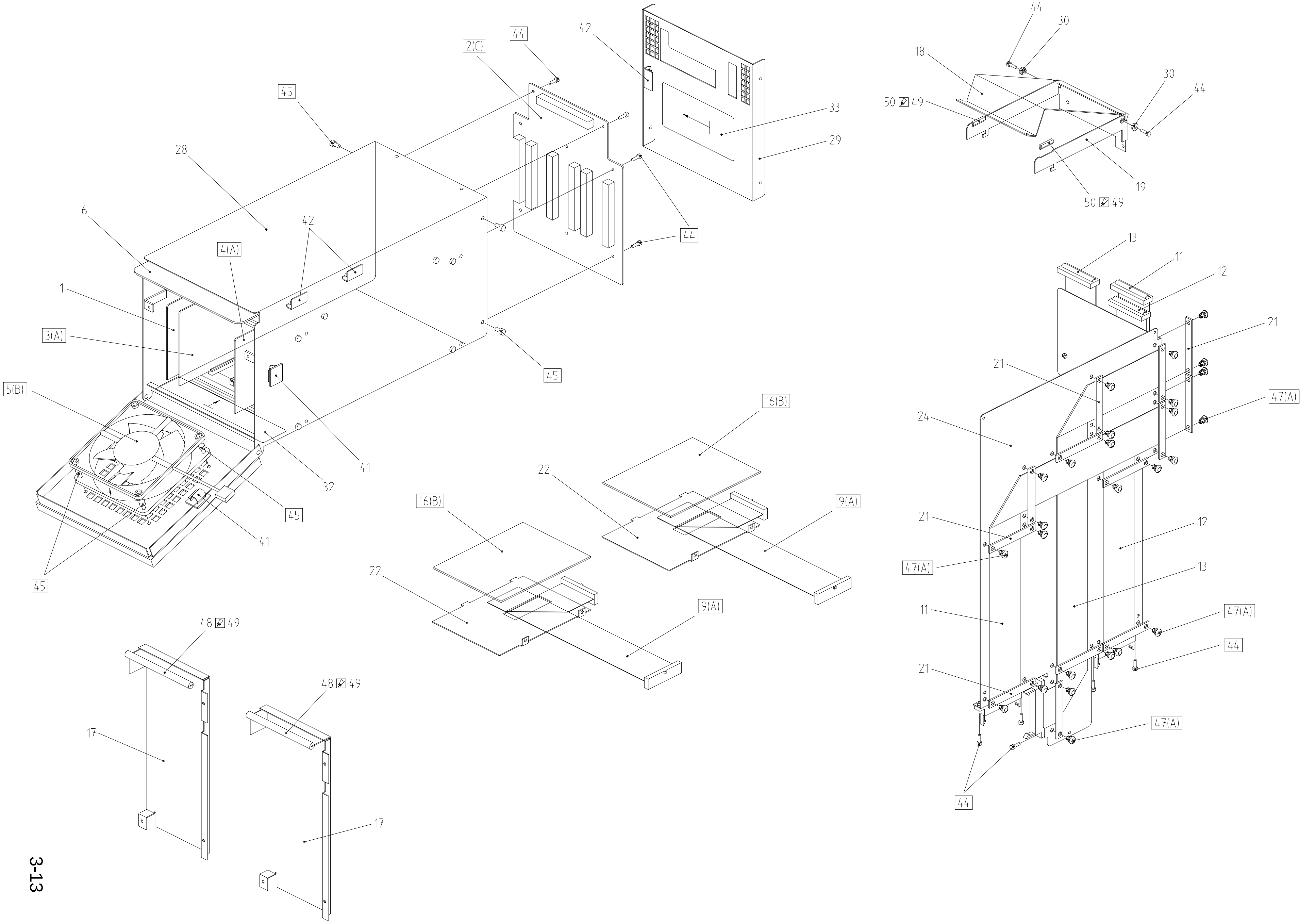
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
146160	PROCESSOR 1 PCB	01	1	1.000	
146164	MOTHERBOARD E PCB	01	2	1.000	C
146174	STEP MOTOR PCB	00	3	1.000	A
146178	INKUBATOR PCB	02	4	1.000	A
146242	EL. RACK FAN	00	5	1.000	B
146284	POWER SUPPLY 1 PCB	04	6	1.000	A
146329	CABLE E1	00	7	1.000	
146330	CABLE E2	00	8	2.000	
146352	CABLE E20	00	9	2.000	A
146354	CABLE E8	00	10	1.000	
146361	CABLE E5	00	11	1.000	
146362	CABLE E6	00	12	1.000	
146363	CABLE E4	00	13	1.000	
147293	INC. TOWER LIFT	00	14	2.000	B
147466	INC. TOWER - CONTR. TEMP.	00	15	2.000	
148354	KAMMERISOLIERMATTE	00	16	2.000	
147481	KABELSCHUTZ	00	17	2.000	
147484	KAMMERDACH	00	18	1.000	
147487	KAMMERWAND	00	19	1.000	
147530	INCUBATOR MODULE FRAME	00	20	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147638	KABELKLEMME	00	21	13.000	A
147657	TOWERBODENBLECH	00	22	2.000	
147789	SEITENBLECH RECHTS	00	23	1.000	
147796	KABELFUEHRUNG 1	00	24	1.000	
147819	HAUBE W/D-MODULE	00	25	1.000	
147820	SEITENBLECH LINKS UNTEN	00	26	1.000	
147821	RUECKWANDBLECH	00	27	1.000	
147824	EL.RACK GEHAEUSE	01	28	1.000	
147994	EL.RACK RUECKWAND	00	29	1.000	
253007	SINTERBZ LAG.3E7/6r7/9 2.5+1.5	00	30	2.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	31	1.000	
255087	KLEBER PCB-POS. INK.-MODULE	00	32	1.000	
255097	KLEBER KABEL-POS. INK.-MODULE	00	33	1.000	
361036	KABELHALTER	00	41	2.000	
361004	KABELBEF. CFCC-4 1/2”	00	42	3.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	43	34.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	44	18.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	45	8.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	46	10.000	
422002	SPREIZNIETE KST D=5 KB=3.5-4.5	00	47	26.000	A
7279460	MOOSGUMMI RUND d= 8 EPDM	00	48	0.210	
511030	SICOMET 77	00	49	0.000	
7279267	KANTENSCHUTZ SCHLITZ B= 1,0	00	50	0.040	
148250	ABDECKBLECH	00	51	1.000	
255042	WARNZ. BIOGEFAEHRDUNG	00	52	1.000	
608298	Q-BESCHEINIGUNG INC. MOD.	02	250	1.000	
608303	TECHN. STAND INC. MOD.	01	251	1.000	
309075	TEMP. INDIKATOR SELBSTK.	00	300	20.000	

3.1.9 3D Drawings

Next two pages

Incubator Module Raw 147 788/1 revision 00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2(C)
42
45
28
6
42
4(A)
1
3(A)
5(B)
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50 49
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50 49
13
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21
21
47(A)
24
16(B)
22
9(A)
16(B)
22
9(A)
21
47(A)
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47(A)
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47(A)
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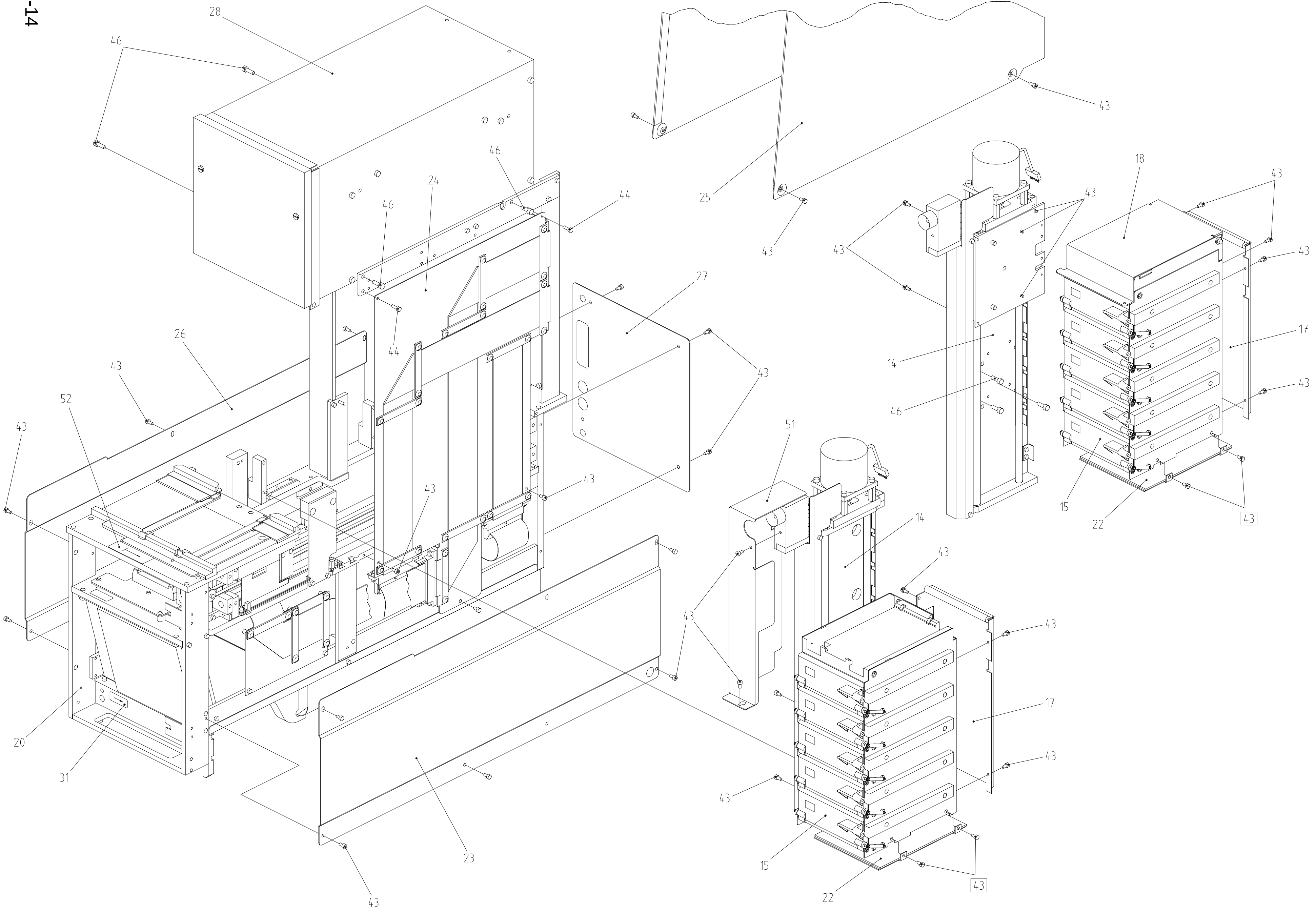
48 49
17

Incubator Module Raw

147 788/2 revision 00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3.1.10 Troubleshooting

See Entry Module Chapter

Incubator Module Frame

147 530

Functional Description

Connector Boards

I1	146 156	
E2	146 252	(See Entry Frame)
E5	146 248	
E6	146 311	
E7	146 312	
E13	146 390	

Replacing Spare Parts

Spare Parts List

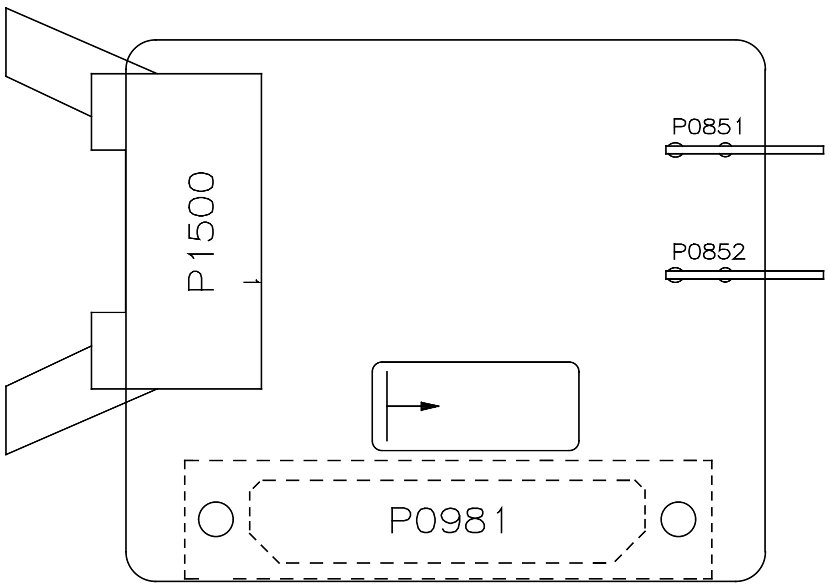
3D Drawing

3.2 Incubator Module Frame p/n 147 530

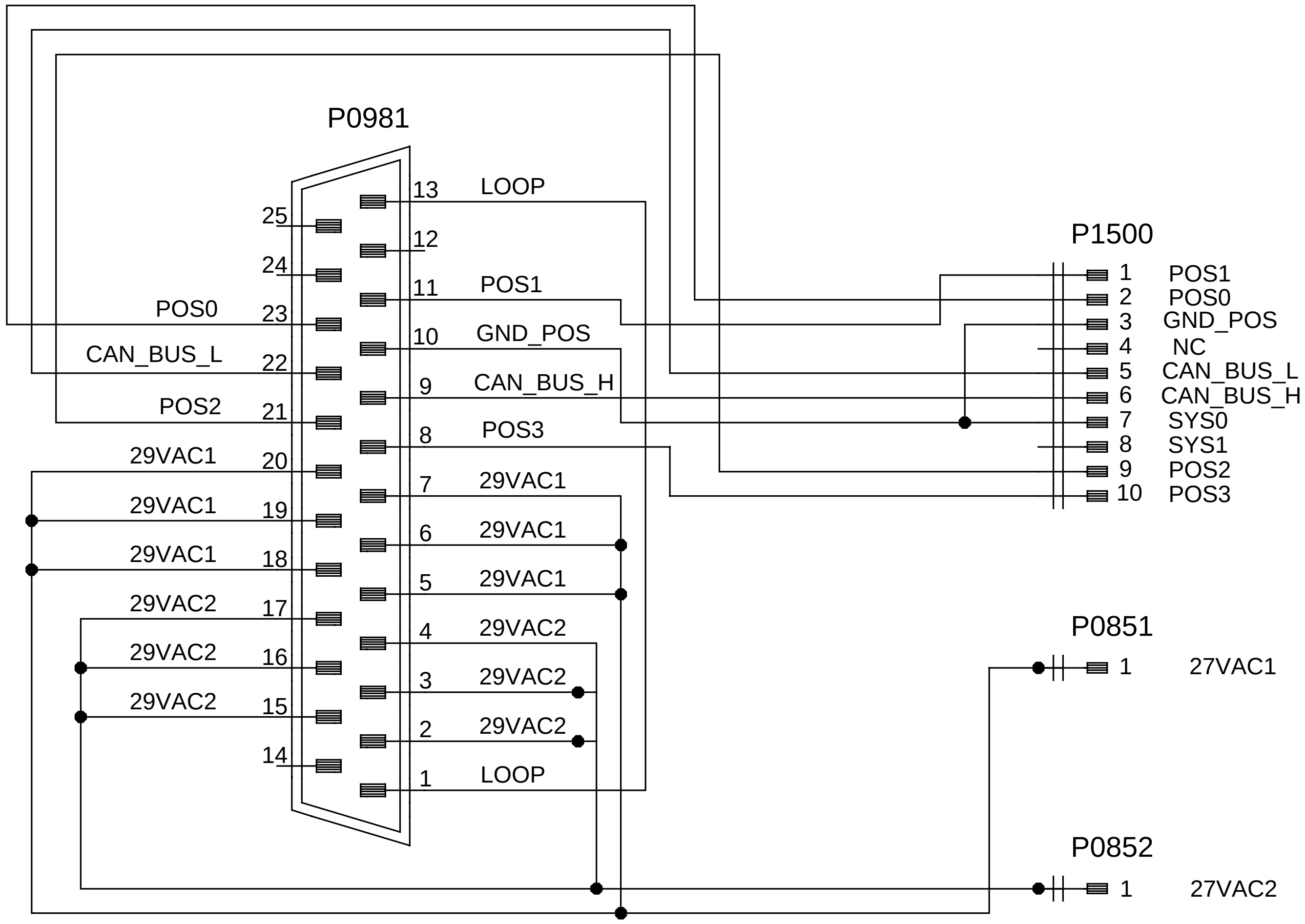
3.2.1 Functional Description

3.2.2 Connector Boards

Connector Board I1 PCB Component Layout 146 156 revision 00


P1500
1
P0851
P0852
P0981

Connector Board I 1 PCB Interface Board 604 793 revision 00


P0981
13 LOOP
12
11 POS1
10 GND_POS
9 CAN_BUS_H
8 POS3
7 29VAC1
6 29VAC1
5 29VAC1
4 29VAC2
3 29VAC2
2 29VAC2
1 LOOP
25
24
POS0 23
CAN_BUS_L 22
POS2 21
29VAC1 20
29VAC1 19
29VAC1 18
29VAC2 17
29VAC2 16
29VAC2 15
14
P1500
1 POS1
2 POS0
3 GND_POS
4 NC
5 CAN_BUS_L
6 CAN_BUS_H
7 SYS0
8 SYS1
9 POS2
10 POS3
P0851
1 27VAC1
P0852
1 27VAC2

3.2.3 Replacing Spare Parts

See Entry Module

3.2.4 Spare Parts List

INCUBATOR MODULE FRAME 147 530 Revision: 00

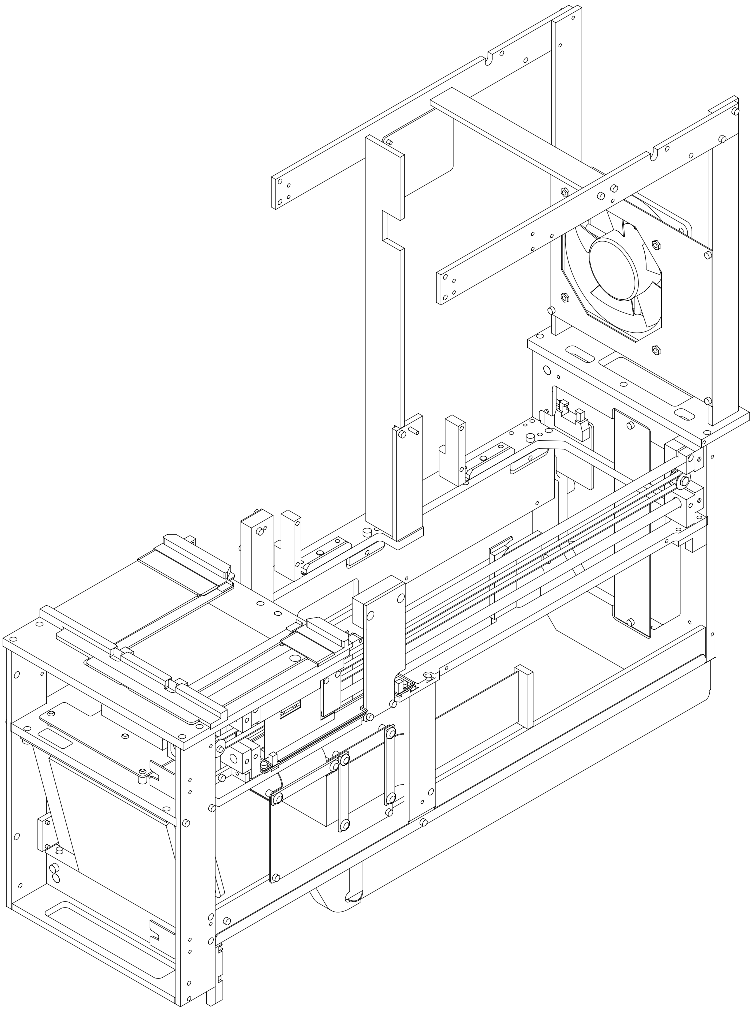
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
148262	ROLLE 1	01	1	1.000	
137609	ACHSSCHRAUBE	00	2	1.000	
146156	CONNECTORBOARD I1 PCB	00	3	1.000	A
146248	CONNECTORBOARD E5 PCB	00	9	1.000	B
146252	CONNECTORBOARD E2 PCB	00	10	1.000	B
146308	TEMPERATURE SENSOR TS70	00	12	1.000	A
146311	CONNECTORBOARD E6 PCB	00	13	1.000	A
146312	CONNECTORBOARD E7 PCB	00	14	1.000	A
146370	STEP MOTOR E SE10	01	15	1.000	B
146353	CABLE E9	00	18	1.000	C
146365	TOWER FAN FA80	00	20	2.000	B
146390	CONNECTORBOARD E13 PCB	00	21	1.000	A
147319	SCHLITTEN	00	23	1.000	
147320	LAGERBOCK 1	00	24	2.000	
147321	LINEARFUEHRUNGSWELLE	01	25	2.000	
147322	DISTANZHALTER	00	26	2.000	
147323	FUEHRUNGSSTUECK	00	27	1.000	
147324	LS-FAHNE	00	28	1.000	
147325	LAGERBOCK 2	00	29	1.000	
147327	MOTORENBEFESTIGUNG	01	30	1.000	
147330	SPANNVORRICHTUNG	00	31	1.000	
147331	ZAHNRIEMENKLEMME	00	32	1.000	
147336	POSITIONIERSTIFT HINTEN	00	36	2.000	
147337	BEFESTIGUNGSWINKEL	00	37	2.000	
147338	MITTELSTUETZE RECHTS	00	38	1.000	
147340	TRAEGER RECHTS	00	39	1.000	
147341	TRAEGER LINKS	00	40	1.000	
147343	TORSIONSPLATTE RECHTS	00	41	2.000	
147345	KUFE	00	42	2.000	
147346	ANSCHLAG HINTEN	00	43	2.000	
147348	POSITIONIERSTIFT VORNE	00	44	2.000	
147349	LAENGSTRAEGER	00	45	1.000	
147374	ZAHNRIEMENRAD Z = 18	00	46	1.000	
148400	LIFTBEFESTIGUNG	00	47	2.000	
147352	BEFESTIGUNGSPLATTE UNTEN	00	48	2.000	
147353	TUERANSCHLAG	00	49	2.000	
147354	TOWERZENTRIERUNG	00	50	2.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147355	HAUBENANSCHLAG	00	51	1.000	
147356	SENSORHALTER LINKS	00	52	1.000	
147357	SENSORHALTEPLATTE	00	53	1.000	
147358	SENSORHALTER RECHTS	00	54	1.000	
147359	DISTANZPLATTE	00	55	1.000	
147362	RACKSTUETZE HINTEN	00	56	2.000	
147364	RACKLAENGSTRAEGER	00	57	2.000	
147365	RACKAUFLAGE	00	58	1.000	
147366	LUEFTERBEFESTIGUNG	00	59	1.000	
148363	NOCKEN	00	60	2.000	
148364	NOCKENHALTER	00	61	2.000	
147459	GLEITBAHN 3	00	62	1.000	
147531	MODULTRAEGER 2	00	63	1.000	
148183	BODEN INCUBATOR	00	64	1.000	
147533	GRUNDPLATTE	01	65	1.000	
147534	BASISPLATTE VORNE	01	66	1.000	
147535	RUECKWAND	00	67	1.000	
147536	MITTELSTUETZE LINKS	00	68	1.000	
147538	BASISPLATTE HINTEN	00	69	1.000	
147540	RACKSTUETZE VORNE	01	70	1.000	
147543	LUEFTERBLECH	00	71	1.000	
147545	GLEITBAHN 4	00	72	1.000	
147546	FUEHRUNGSLEISTE 2	00	73	1.000	
147573	CODE BOLZEN	00	74	1.000	
147638	KABELKLEMME	00	75	3.000	A
147641	SCHUTZBLECH	00	77	1.000	
147683	FILTERMATTE	00	78	1.000	A
147684	KABELFHRUNG 2	00	79	1.000	
147686	ZAHNRIEMENRAD Z=58	00	80	1.000	
147735	LAGERWELLE	00	81	1.000	
147764	WINKEL MIT SCHLITZ	00	83	2.000	
147777	ABDECKFOLIE	00	84	1.000	A
147913	DECKBLECH 2	00	87	1.000	
251924	ZYL-SRIFT 3 X14 VSM12771B	00	91	1.000	
251932	ZYL.STIFT 4 X10 VSM12771B	00	92	22.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	93	1.000	
279279	SINTERBZ.LAGER 5E7/10R7/12 4+2	00	94	2.000	
422002	SPREIZNIETE KST D=5 KB=3.5-4.5	00	95	6.000	A
279365	SINTERBZ.LAGER 8E7/11R7/ 8 MM	00	96	3.000	
253021	GLEITLAGER 5D10/8X5	00	97	1.000	
361000	KABELBEF. L=100 B=2.5 MM	00	98	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	100	24.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	101	99.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	103	10.000	
403491	SENKSCHRAUBE M 4X 8 DIN7991	00	106	4.000	
405062	GEW.STIFT VERZ M 4X 5 DIN913	00	108	5.000	
413045	RINGFEDER SCHWARZ NR.5 BN816	00	110	2.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	111	9.000	
420214	PT-SENKKOPFSCHRAUBE KA 30 X 8	00	112	1.000	A
420331	LINSENSCHR M3 X16 ISO7380	00	113	5.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
511006	LOCTITE 222 50mL	00	114	0.000	T
258052	ZAHNRIEMEN MXL Z=546 X 3/16”	00	115	1.000	C
258053	ZAHNRIEMEN MXL Z= 83 X 3/16”	00	116	1.000	C
148248	KLETTVERSCHLUSS	00	117	4.000	A
420332	DRUCKSTUECK M4 X 9	00	118	1.000	
148182	GRIFFPLATTE 2	00	119	1.000	
148257	PRINTABDECKUNG	00	123	1.000	
511032	SICOMET 8400	00	124	0.000	
256013	DRUCKFED d 0,4 Da 4 Lo 9,5	00	125	4.000	
148228	MODULE TRANSPORT FORK COMPL.	01	135	1.000	A
255385	IDENTIFIKATIONSLABEL ORANGE	00	150	1.000	

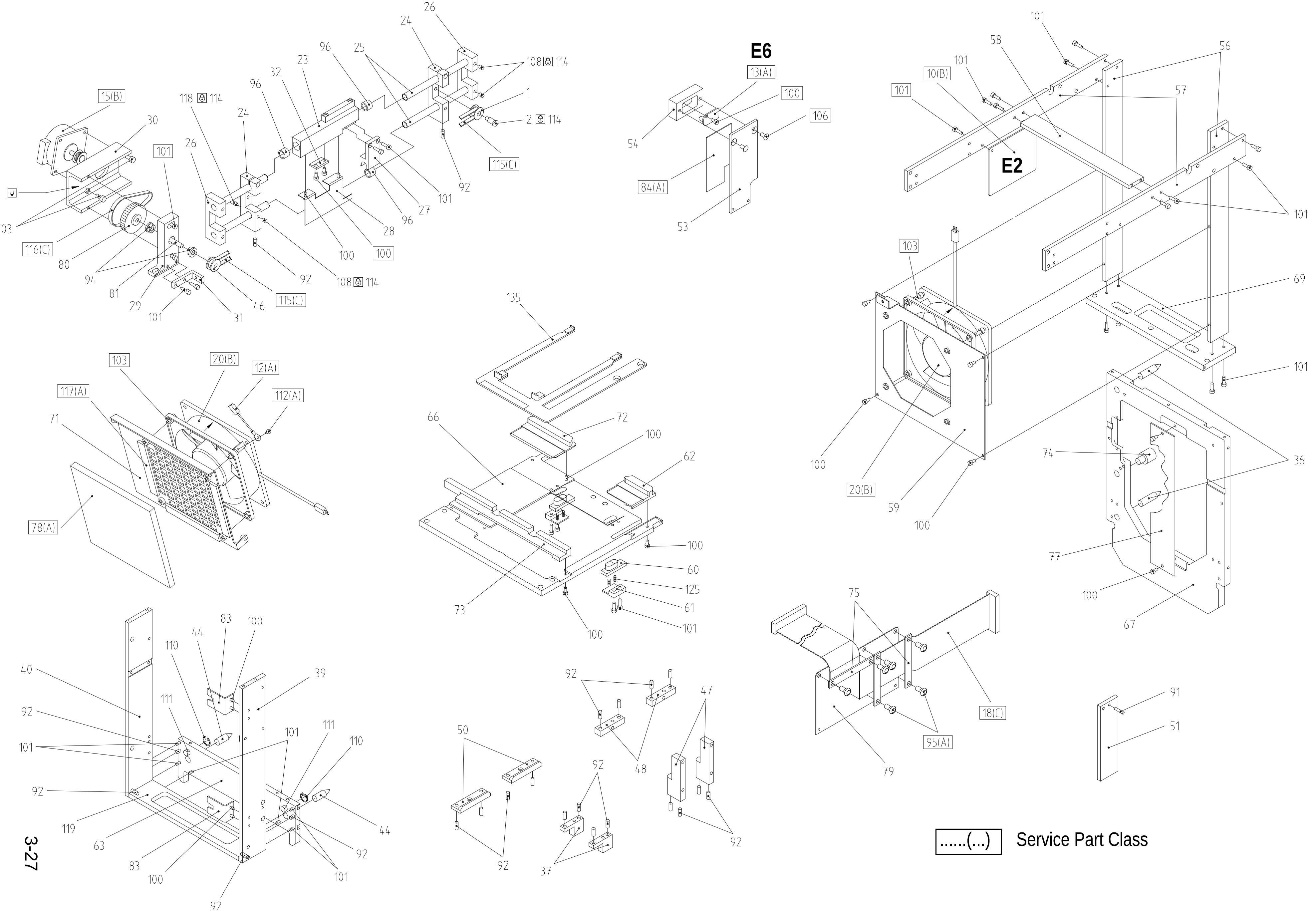
3.2.5 3D Drawings

Incubator Module Frame 147 530/3 revision 05



Incubator Module Frame

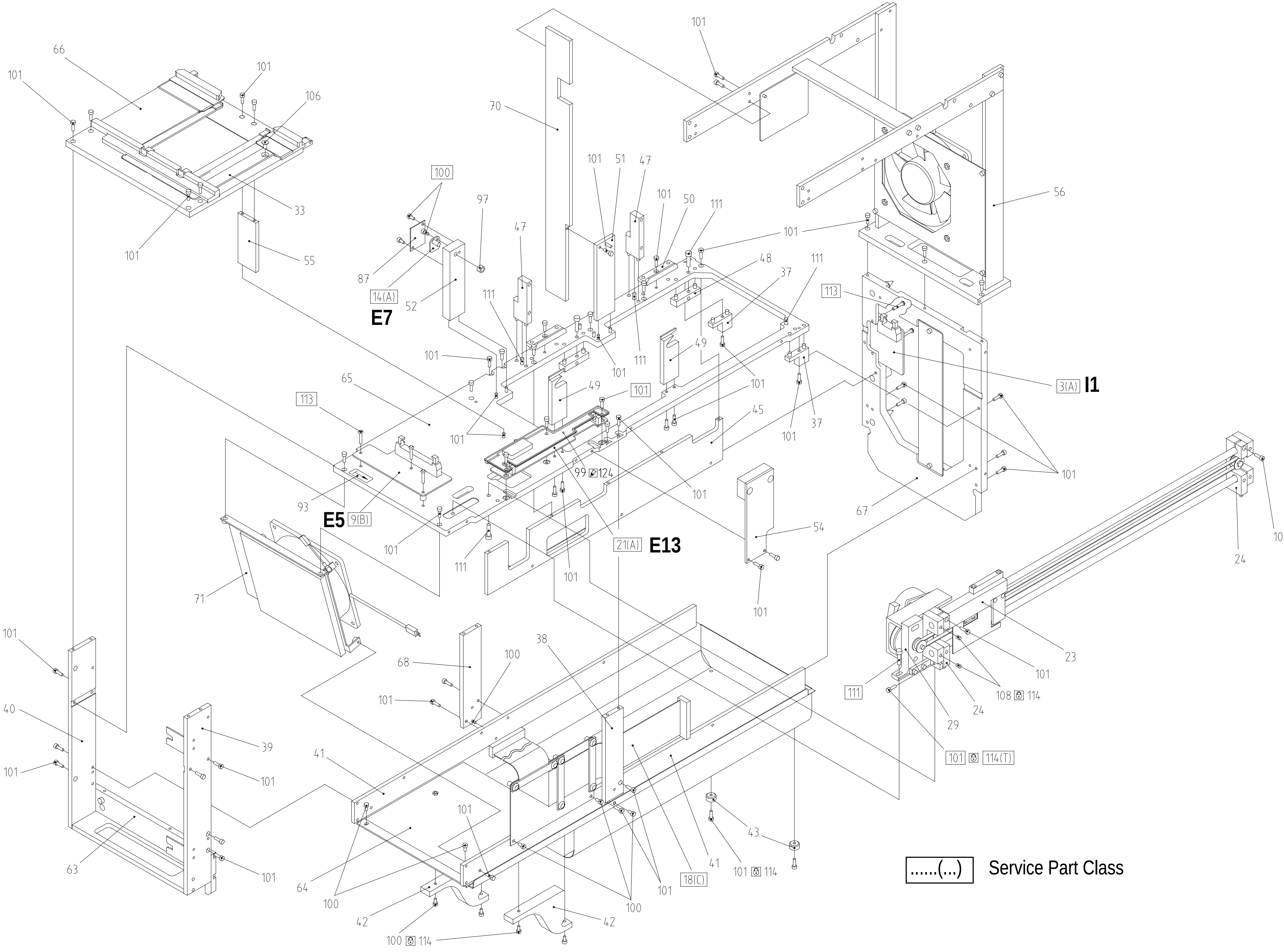
147 530/1 revision 05


E6
E2
26
24
96
25
23
32
96
108 114
1
2 114
15(B)
118 114
24
30
101
26
103
116(C)
80
94
81
29
101
31
46
115(C)
108 114
92
100
100
28
96
27
101
92
115(C)
13(A)
100
106
54
84(A)
53
101
58
101
10(B)
101
56
57
101
103
69
101
36
74
77
100
67
20(B)
59
100
100
103
20(B)
12(A)
117(A)
112(A)
71
78(A)
135
66
72
100
62
100
60
125
61
101
73
100
83
100
44
110
40
39
111
92
101
111
101
110
92
119
63
83
100
44
92
101
92
50
92
92
48
92
37
47
92
75
18(C)
95(A)
79
91
51

......(...) Service Part Class

Incubator Module Frame

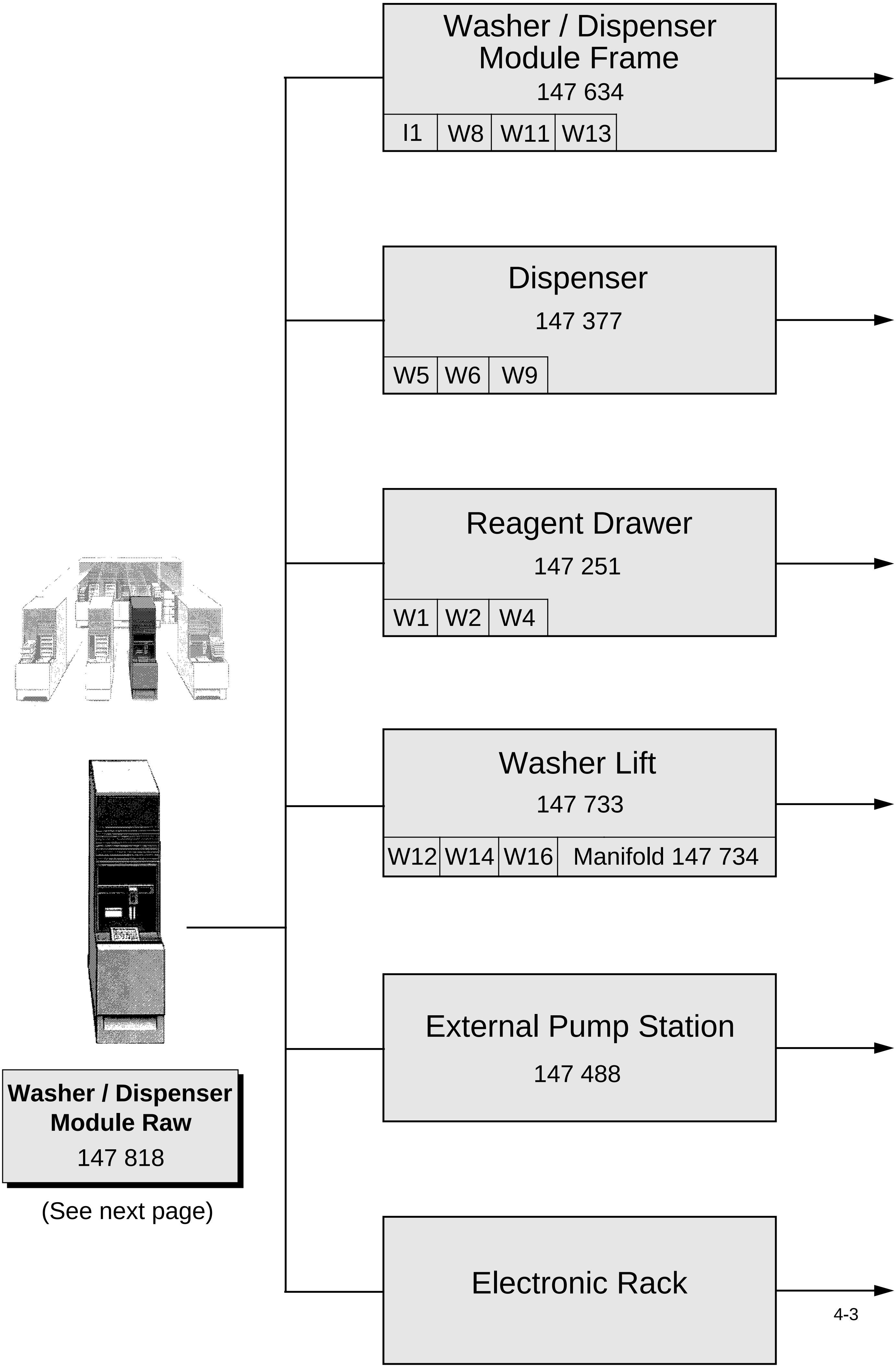
147 530/2 revision 05


66
101
101
106
33
101
55
70
100
97
87
14(A)
E7
52
47
101
51
47
101
50
111
48
37
111
101
56
113
111
101
111
101
49
101
65
113
101
49
101
45
101
37
3(A)
I1
101
99 124
93
E5
9(B)
101
111
21(A)
E13
101
101
54
67
101
24
101
71
101
68
100
38
23
101
108 114
24
29
111
101 114(T)
40
39
101
41
101
63
101
64
100
42
100 114
43
101 114
41
18(C)
101
100
42

......(...) Service Part Class

3.2.6 Troubleshooting

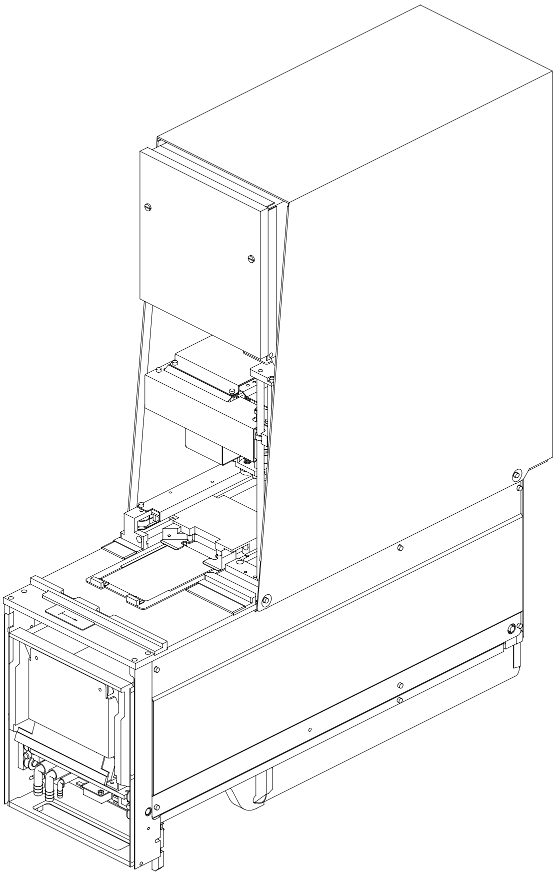
See Entry Module: Entry Frame, Incubator Tower Lift, Incubator Tower Ambient & Incubator Tower Controlled.


Washer / Dispenser Module Frame
147 634
I1
W8
W11
W13
Dispenser
147 377
W5
W6
W9
Reagent Drawer
147 251
W1
W2
W4
Washer Lift
147 733
W12
W14
W16
Manifold 147 734
External Pump Station
147 488
Electronic Rack
Washer / Dispenser Module Raw
147 818
(See next page)

Washer / Dispenser Module Raw

147 818

- Design
- Functional Description
  - Washer / Dispenser Module
- Calibration, Adjusting
- Removing Wash / Disp. Module
- Removing Assemblies
  - Dispenser
  - Reagent Drawer
  - Washer Lift
  - External Pump Station
  - Electronic Rack
- Replacing Spare Parts
- Spare Parts List
- 3D Drawing
- Fluid-Flow Diagram
- Troubleshooting



4 WASHER / DISPENSER

4.1 Washer / Dispenser Module Raw 147 818

4.1.1 Design

Refer to the drawings on the following pages:

- ❒ Block Diagram Dispenser System Dwg No. 614 140
- ❒ Block Diagram Washer System Dwg No. 614 146

Block Diagram Dispenser System 614.140 revision 01 (VD)

Actors:

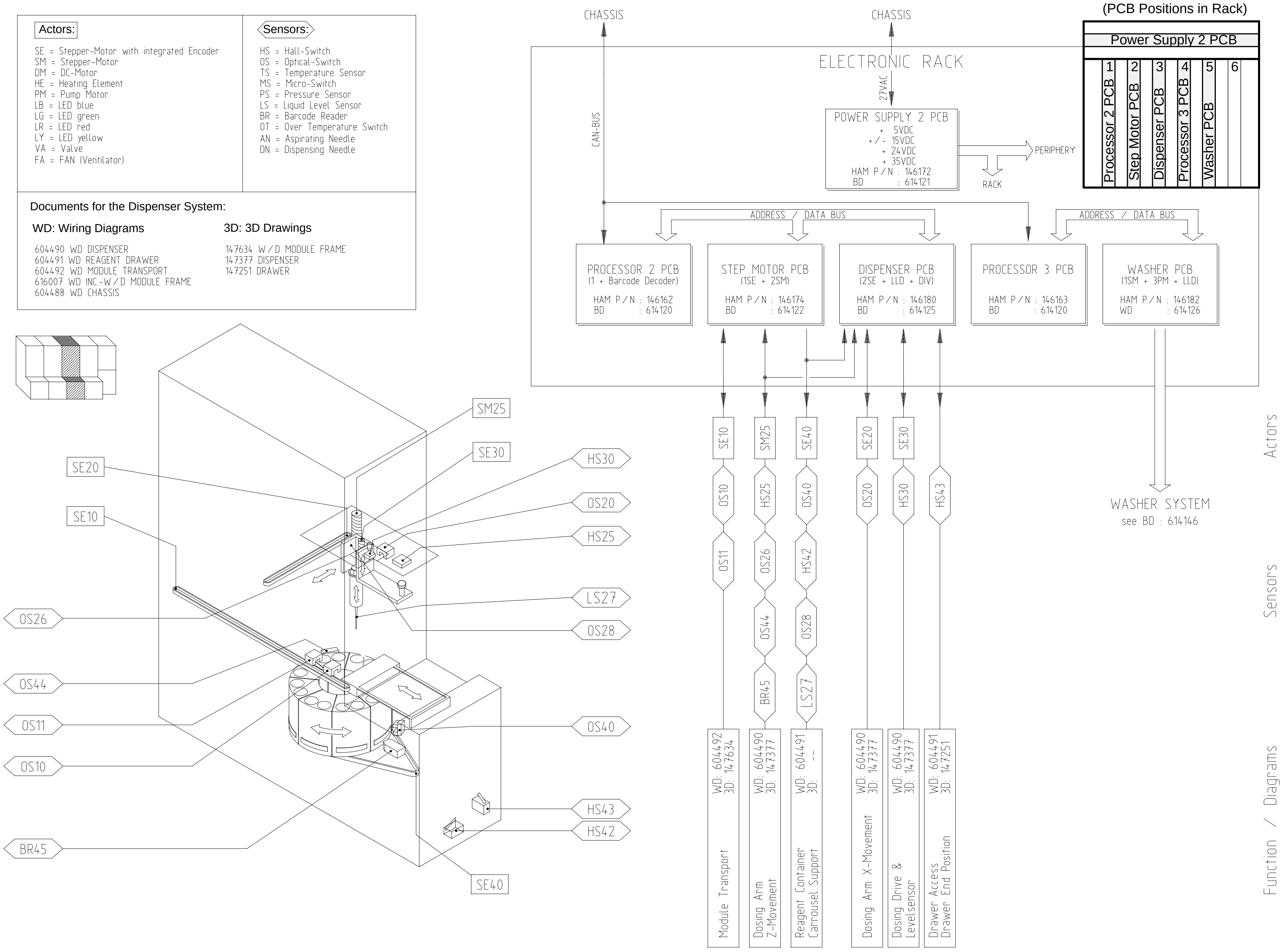
SE = Stepper-Motor with integrated Encoder
SM = Stepper-Motor
DM = DC-Motor
HE = Heating Element
PM = Pump Motor
LB = LED blue
LG = LED green
LR = LED red
LY = LED yellow
VA = Valve
FA = FAN (Ventilator)

Sensors:

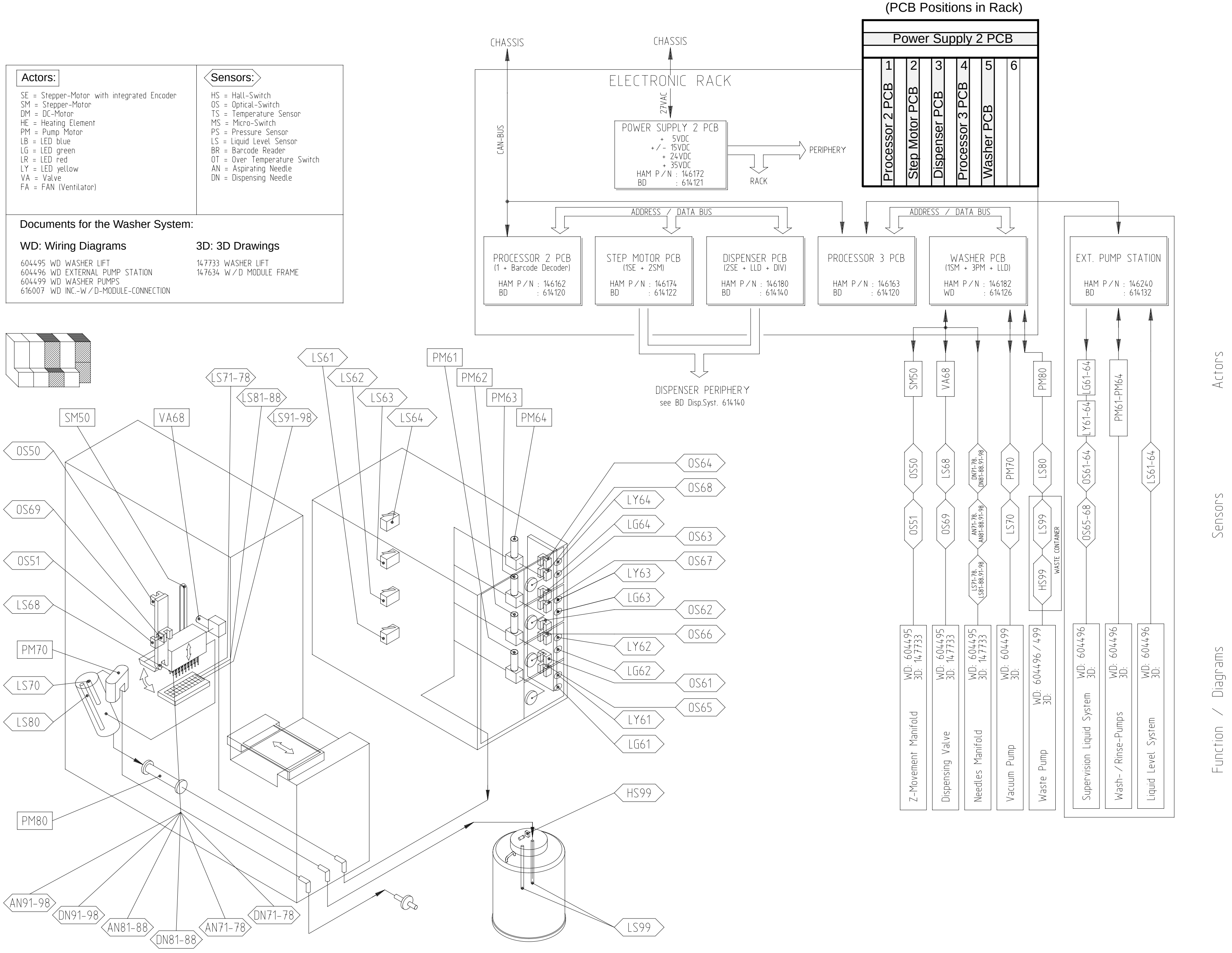
HS = Hall-Switch
OS = Optical-Switch
TS = Temperature Sensor
MS = Micro-Switch
PS = Pressure Sensor
LS = Liquid Level Sensor
BR = Barcode Reader
OT = Over Temperature Switch
AN = Aspirating Needle
DN = Dispensing Needle

Documents for the Dispenser System:

WD: Wiring Diagrams	3D: 3D Drawings
604490 WD DISPENSER	147634 W/D MODULE FRAME
604491 WD REAGENT DRAWER	147377 DISPENSER
604492 WD MODULE TRANSPORT	147251 DRAWER
616007 WD INC.-W/D MODULE FRAME	
604488 WD CHASSIS	


CHASSIS
CHASSIS
ELECTRONIC RACK
CAN-BUS
27VAC
POWER SUPPLY 2 PCB
+ 5VDC
+/- 15VDC
+ 24VDC
+ 35VDC
HAM P/N : 146172
BD : 614121
PERIPHERY
RACK
(PCB Positions in Rack)
Power Supply 2 PCB
1 Processor 2 PCB
2 Step Motor PCB
3 Dispenser PCB
4 Processor 3 PCB
5 Washer PCB
6
ADDRESS / DATA BUS
ADDRESS / DATA BUS
PROCESSOR 2 PCB
(1 + Barcode Decoder)
HAM P/N : 146162
BD : 614120
STEP MOTOR PCB
(1SE + 2SM)
HAM P/N : 146174
BD : 614122
DISPENSER PCB
(2SE + LLD + DIV)
HAM P/N : 146180
BD : 614125
PROCESSOR 3 PCB
HAM P/N : 146163
BD : 614120
WASHER PCB
(1SM + 3PM + LLD)
HAM P/N : 146182
WD : 614126
WASHER SYSTEM
see BD : 614146
Actors
Sensors
Function / Diagrams
SE10
OS10
OS11
WD: 604492
3D: 147634
Module Transport
SM25
HS25
OS26
OS44
BR45
WD: 604490
3D: 147377
Dosing Arm
Z-Movement
SE40
OS40
HS42
OS28
LS27
WD: 604491
3D: --
Reagent Container
Carrousel Support
SE20
OS20
WD: 604490
3D: 147377
Dosing Arm X-Movement
SE30
HS30
WD: 604490
3D: 147377
Dosing Drive &
Levelsensor
HS43
WD: 604491
3D: 147251
Drawer Access
Drawer End Position
SM25
SE30
SE20
SE10
HS30
OS20
HS25
LS27
OS28
OS26
OS44
OS11
OS10
OS40
HS43
HS42
BR45
SE40

Block Diagram Washer System 614.146 revision 00 (VD)


(PCB Positions in Rack)
Power Supply 2 PCB
1 Processor 2 PCB
2 Step Motor PCB
3 Dispenser PCB
4 Processor 3 PCB
5 Washer PCB
6
CHASSIS
CHASSIS
ELECTRONIC RACK
27VAC
CAN-BUS
POWER SUPPLY 2 PCB
+ 5VDC
+/- 15VDC
+ 24VDC
+ 35VDC
HAM P/N : 146172
BD : 614121
PERIPHERY
RACK
ADDRESS / DATA BUS
ADDRESS / DATA BUS
PROCESSOR 2 PCB
(1 + Barcode Decoder)
HAM P/N : 146162
BD : 614120
STEP MOTOR PCB
(1SE + 2SM)
HAM P/N : 146174
BD : 614122
DISPENSER PCB
(2SE + LLD + DIV)
HAM P/N : 146180
BD : 614140
PROCESSOR 3 PCB
HAM P/N : 146163
BD : 614120
WASHER PCB
(1SM + 3PM + LLD)
HAM P/N : 146182
WD : 614126
EXT. PUMP STATION
HAM P/N : 146240
BD : 614132
DISPENSER PERIPHERY
see BD Disp.Syst. 614140
SM50
VA68
PM80
LG61-64
LY61-64
PM61-PM64
OS50
LS68
DN71-78, DN81-88,91-98
PM70
LS80
OS61-64
LS61-64
OS51
OS69
AN71-78, AN81-88,91-98
LS70
LS99
OS65-68
LS71-78, LS81-88,91-98
HS99
WASTE CONTAINER
Z-Movement Manifold WD: 604495 3D: 147733
Dispensing Valve WD: 604495 3D: 147733
Needles Manifold WD: 604495 3D: 147733
Vacuum Pump WD: 604499 3D:
Waste Pump WD: 604496/499 3D:
Supervision Liquid System WD: 604496 3D:
Wash-/Rinse-Pumps WD: 604496 3D:
Liquid Level System WD: 604496 3D:
Actors
Sensors
Function / Diagrams
LS61
PM61
LS71-78
LS62
PM62
LS81-88
LS63
PM63
SM50
VA68
LS91-98
LS64
PM64
OS50
OS64
OS68
LY64
OS69
LG64
OS63
OS67
LY63
OS51
LG63
LS68
OS62
OS66
LY62
PM70
LG62
LS70
OS61
OS65
LY61
LS80
LG61
HS99
PM80
AN91-98
DN91-98
AN81-88
DN81-88
AN71-78
DN71-78
LS99

Actors:

SE = Stepper-Motor with integrated Encoder
SM = Stepper-Motor
DM = DC-Motor
HE = Heating Element
PM = Pump Motor
LB = LED blue
LG = LED green
LR = LED red
LY = LED yellow
VA = Valve
FA = FAN (Ventilator)

Sensors:

HS = Hall-Switch
OS = Optical-Switch
TS = Temperature Sensor
MS = Micro-Switch
PS = Pressure Sensor
LS = Liquid Level Sensor
BR = Barcode Reader
OT = Over Temperature Switch
AN = Aspirating Needle
DN = Dispensing Needle

Documents for the Washer System:

WD: Wiring Diagrams

604495 WD WASHER LIFT
604496 WD EXTERNAL PUMP STATION
604499 WD WASHER PUMPS
616007 WD INC.-W/D-MODULE-CONNECTION

3D: 3D Drawings

147733 WASHER LIFT
147634 W/D MODULE FRAME

4.1.2 Functional Description W / D Module

The Washer/Dispenser Module washes plates and dispenses reagents for ELISA tests.

Wash Functions:

- ❒ 24 channel manifold (3 rows)
- ❒ Liquid level detection for:
  - ❒ each aspiration channel (dead vol. < 5 µl)
  - ❒ each dispense channel
  - ❒ auto-calibration of manifold, liquid level detection with every “cold start”
  - ❒ waste container
- ❒ Programmable:
  - ❑ wash mode
  - ❑ soak time
  - ❑ volume
  - ❑ solution
- ❒ Plate wash takes 30 seconds
- ❒ Suitable for all types of micro titer plates (round bottom, flat bottom, conical bottom)

Dispensing Functions:

- ❒ Disposable syringe (20 ml) eliminates carryover
- ❒ Single channel dispenser
- ❒ Programmable:
  - ❒ dispense volume 25 to 200µl
  - ❒ dispense time is 60 seconds per plate
- ❒ Reagent carousel (8 reagent containers, 8 syringes)
- ❒ Liquid-level-controlled reagent aspiration

For further information consult the User Manual section 2.5.

4.1.3 Removing Washer / Dispenser Module

Remove transparent cover, upper front, hardtop, and main shuttle rail, (see section 1.1.5.3.2).

Remove washer / dispenser module (see section 1.1.5.3.3).

ATTENTION
After reinstalling W/D module, carry out instrument calibration as described in section (see section 1.1.4.3.17).

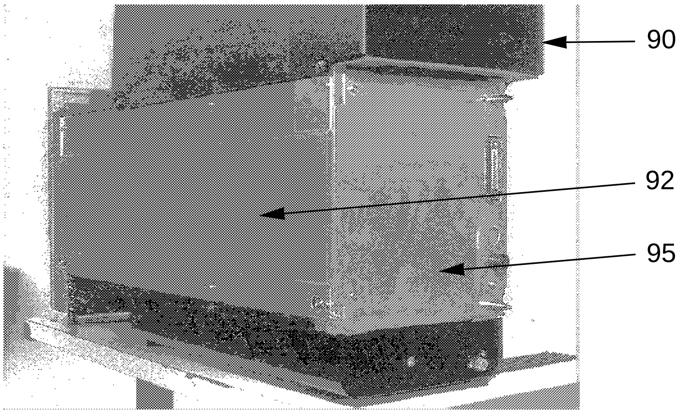
4.1.4 Removing Assemblies

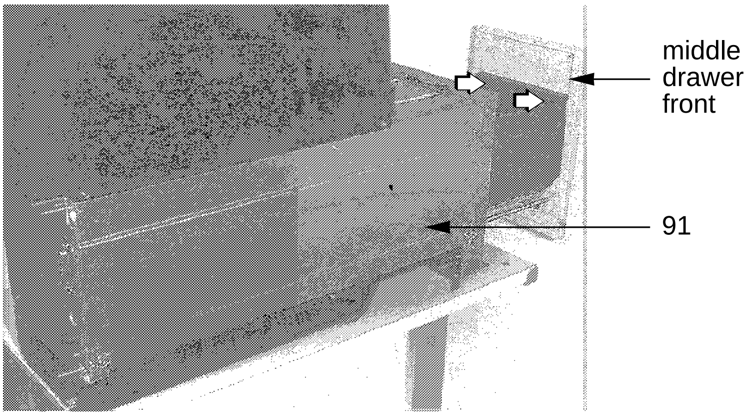
NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

In order to carry out the following tasks, the washer / dispenser module must be removed from the chassis - refer to section 1.1.5.

Some of the following items must be removed to replace spare parts:

- Hood	item 90
- Side cover left	item 91
- Side cover right	item 92
- Rear cover	item 95
- Middle drawer front	



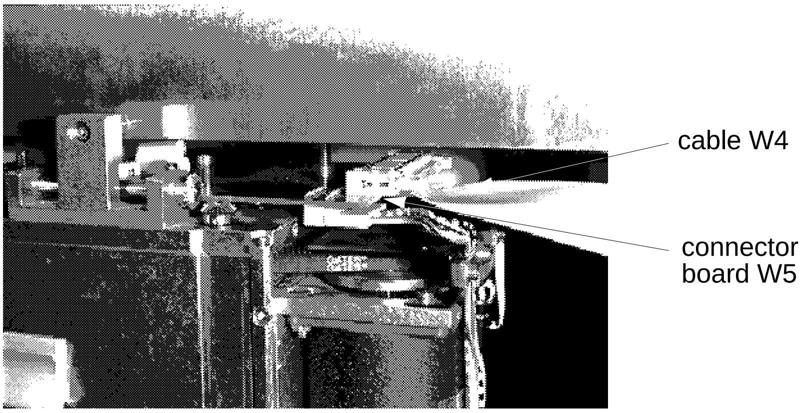


When unscrewing the *middle drawer front* (two screws, see above picture), hold the panel to prevent it from falling on the floor!

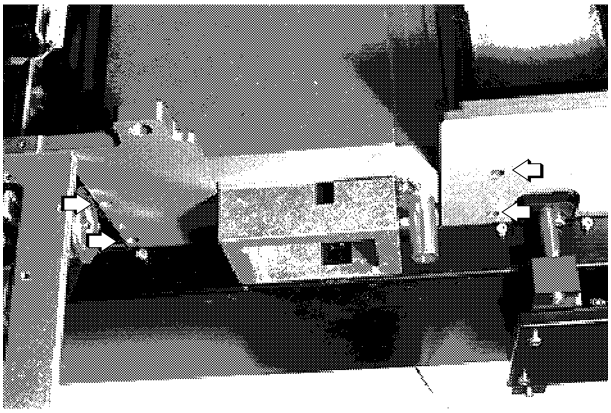
4.1.4.1 Dispenser (item 2)

Remove *hood (item 90*) and *side cover right item 92* (see section 4.1.4).

Disconnect cable W4 on connector board W5.



Unscrew the dispenser (one screw on top, four screws on the bottom).



Lift the dispenser until positioning pins are free (approx. 5 mm 1/4”) and remove.

Calibration will have to be carried out if:

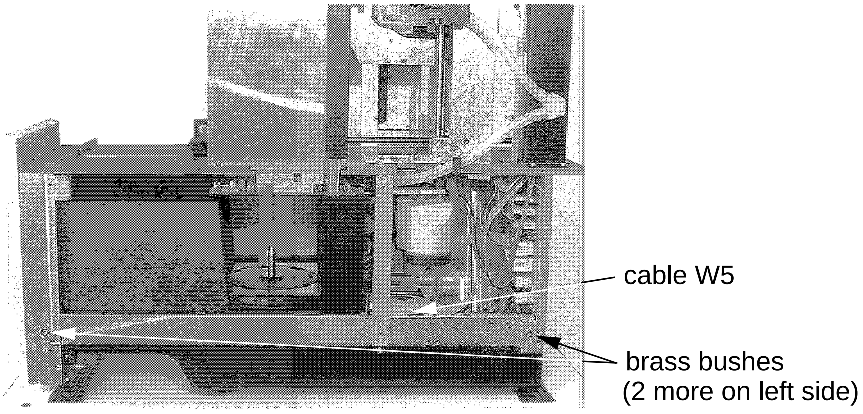
- ❐ the whole dispenser has been replaced
- ❐ connector board W5 has been replaced
- ❐ connector board W6 has been replaced
- ❐ connector board W9 has been replaced
- ❐ regulating screw 1 has been replaced
- ❐ regulating screw 2 has been replaced

Calibration section 1.1.4.3.17 Instrument Calibration.

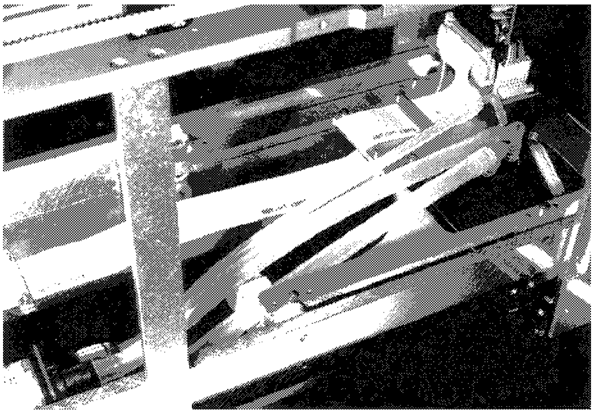
4.1.4.2 Reagent Drawer (item 3)

Remove *side cover left (item 91*), *side cover right (item 92*) and *middle drawer front* (see section 4.1.4).

Unplug cable W5.

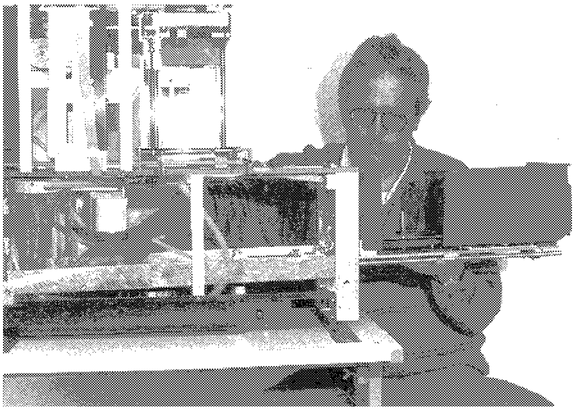

cable W5
brass bushes
(2 more on left side)

Pull the drawer all the way out and pull the three tubes off the tube clips.



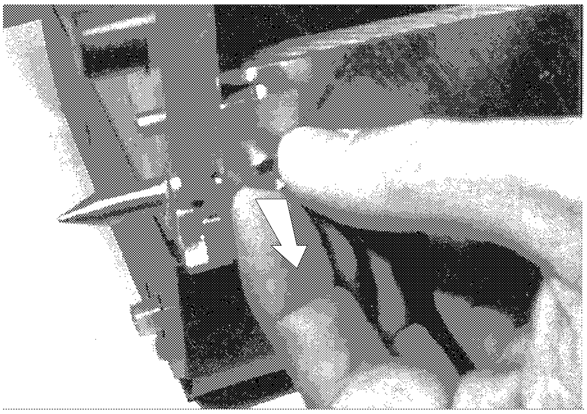
Push the reagent drawer back in and unscrew (4 screws in brass bushes).

Pull drawer all the way out (support in front!). Slightly lift front of drawer and carefully pull it out.



Remounting:

Before remounting the reagent drawer, pull out the two bushes on the ***left*** side of the module 1 to 2 mm.

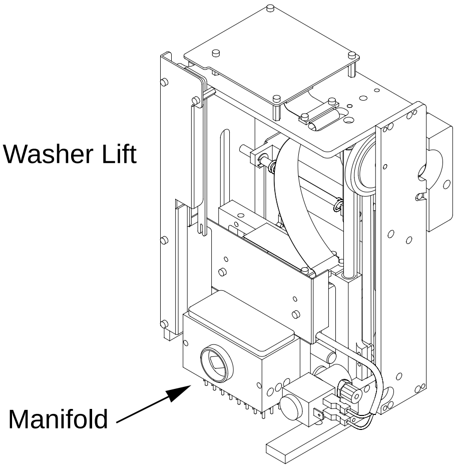


4.1.4.3 Washer Lift (item 4)

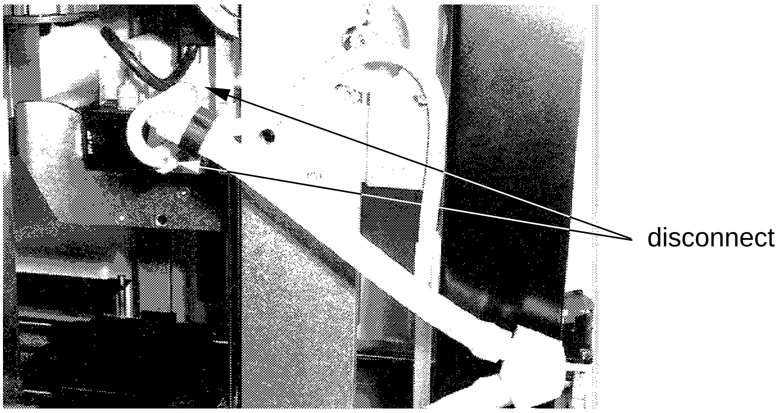
ATTENTION
For safety reasons remove the manifold and the wash shell before removing the washer lift. They could be contaminated, cause injury or become damaged.

BIOHAZARD
HANDLE WITH CARE
BIOGEFÄHRDUNG

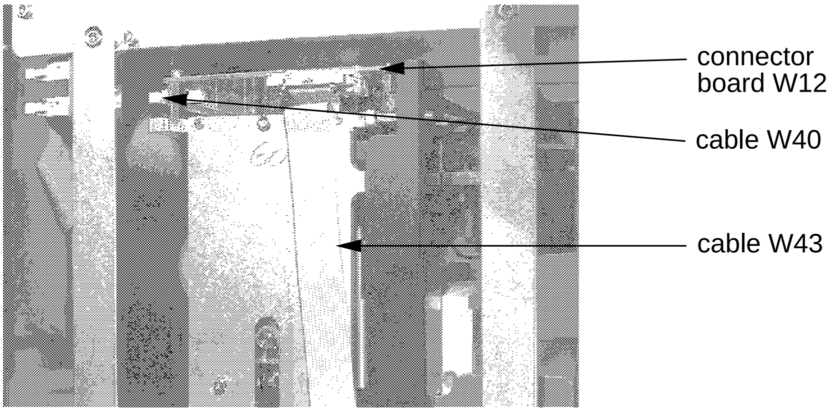
Wear Gloves



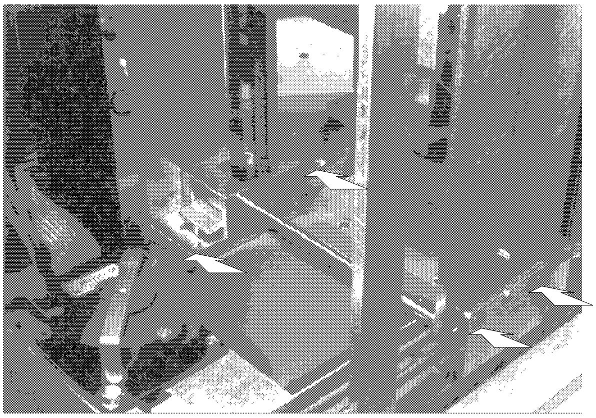
Disconnect the two tubes.



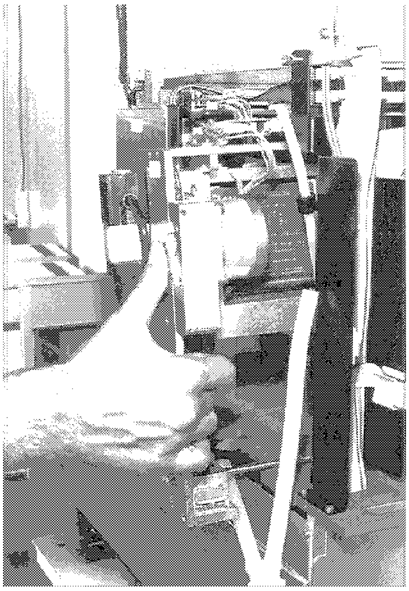
Disconnect cables W40 and W43 from connector board W12.


connector
board W12
cable W40
cable W43

Unscrew the washer lift (4 screws) and remove it carefully from the W/D module.



Removing the washer:



Remounting:

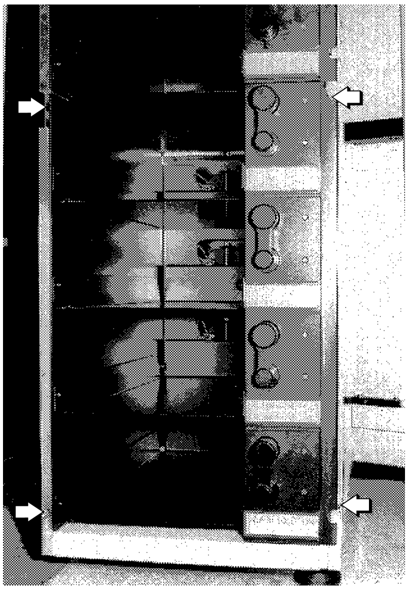
When connecting the smaller tube, i.e. when tightening the nut, hold the tube to prevent it from turning and kinking.

4.1.4.4 External pump station (item 5)

ATTENTION
To keep the External Pump Station stable it is recommended to leave at least two wash fluid containers (the top and bottom one) in the container stack when removing an External Pump Station.

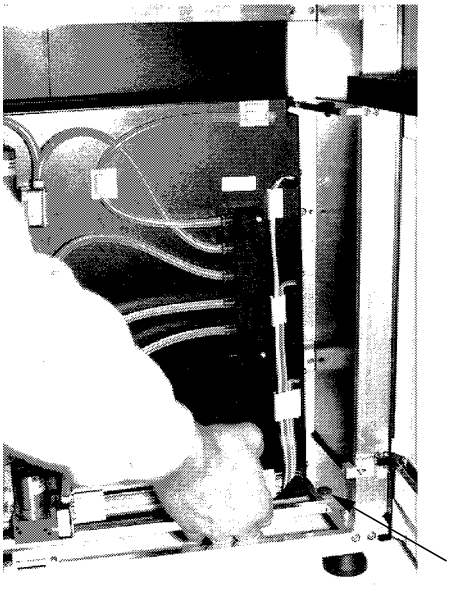
Remove Container Stack: refer to section 1.1.5.3.1.

Unscrew the External Pump Station (4 screws) and pull it carefully out.



Remounting:

Carefully slide the External Pump Station into the frame, lift rear onto the rubber supports.



4.1.5 Replacing Spare Parts

NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

4.1.5.1 Motherboard W/D PCB (item 20)

Remove all PCBs from electronic rack.

Disconnect all connectors from the motherboard.

Unscrew and remove the electronic rack rear panel.

Unscrew and remove the *motherboard W/D PCB (item 20*).

Remounting:

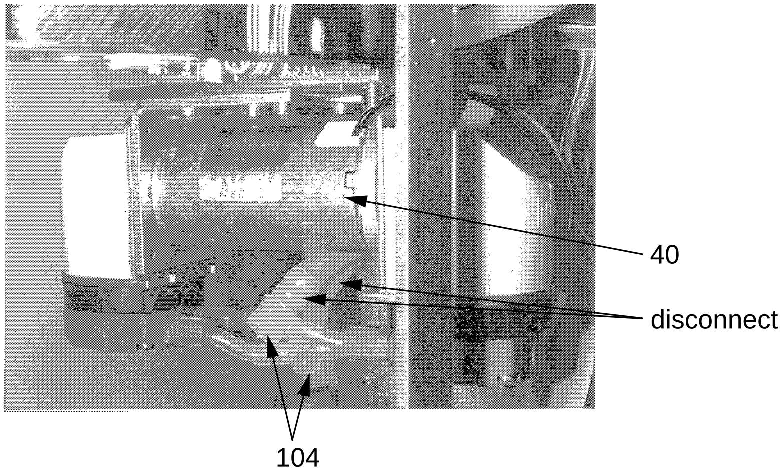
Mount the motherboard, do not tighten the screws. Carefully insert two PCBs in the electronic rack (one on the left, one on the right) aligning the motherboard. Now tighten the motherboard fixing screws.

4.1.5.2 DC motor W PM 70 (item 40)

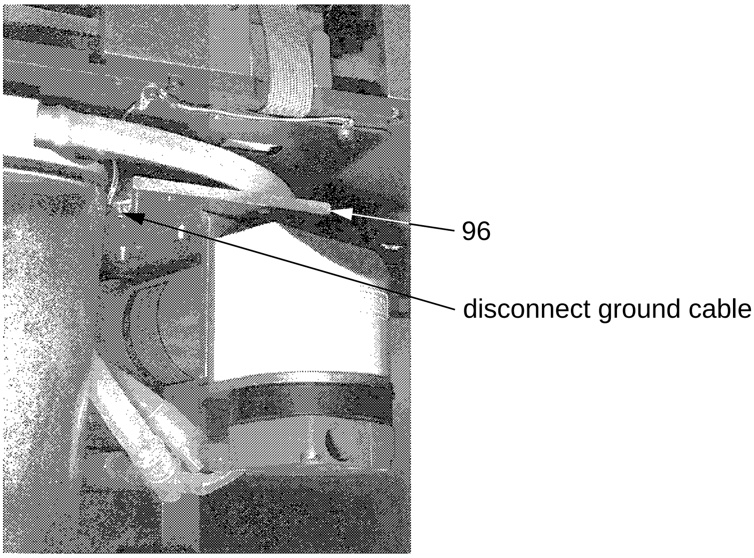
Remove *hood (item 90), side cover left (item 91)* and *side cover right item 92* (see section 4.1.4).

Disconnect the DC motor on connector board W11.

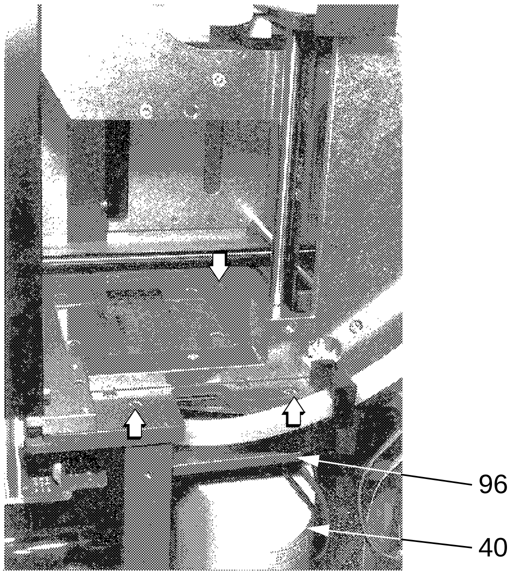
Disconnect the two larger tubes from the *Tees (item 104*) at the DC motor.



Disconnect the ground cable from the *DC motor support plate (item 96*).



Now unscrew (3 screws) the *DC motor support plate (item 96*) complete with *DC motor (item 40).*



Unscrew the DC motor from the support plate, remove the Tees and tubes from the DC motor and mount them on the new DC motor or use new Tees and tubes.

Make sure that the tubes are not kinked!

4.1.5.3 AC motor W PM 80 (item 41)

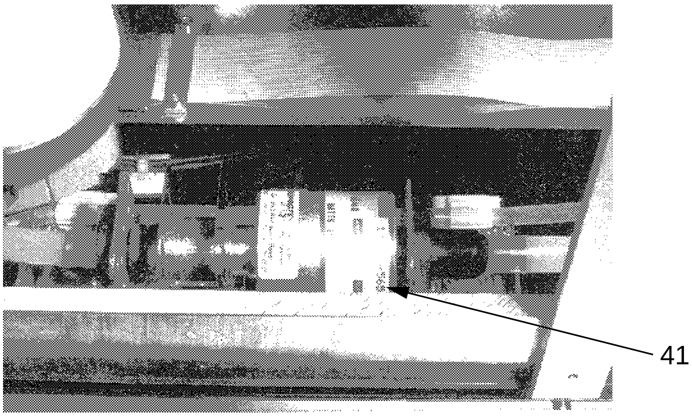
ATTENTION
Make sure the water separator is empty!

Remove *side cover left (item 91)* and *side cover right item 92* (see section 4.1.4).

Open the drawer all the way.

Disconnect the AC motor on connector board W11 and free the cable off the cable clamps (cut tie wraps).

Unscrew the AC motor base (4 screws).



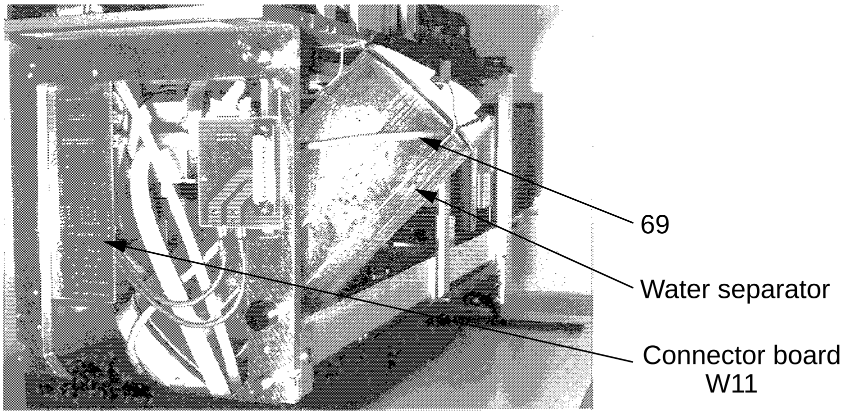
Disconnect the tubes on both sides of the pump (AC motor), use paper towel to absorb remaining fluid in tubes.

4.1.5.4 Cable W32 (item 69)

Remove *hood (item 90), side cover left (item 91)* and *side cover right item 92* (see section 4.1.4).

Disconnect connector 2302 from connector board W11.

Unscrew the water separator (2 screws on top) and pull it out to the left side.



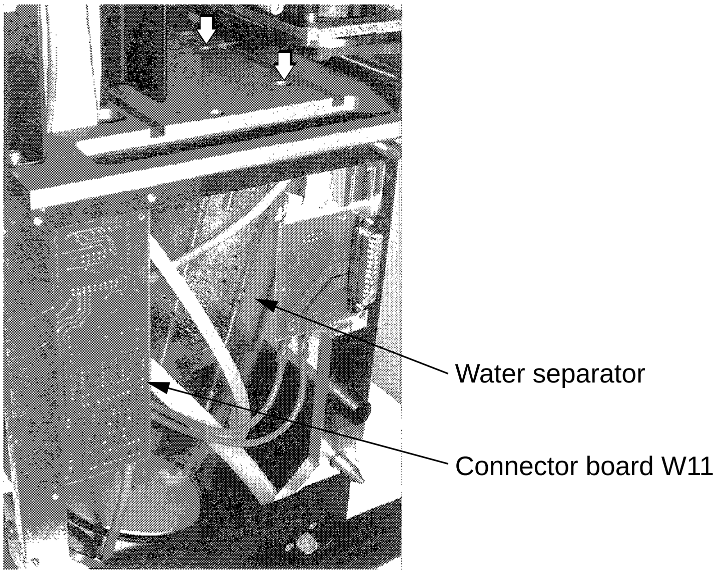
Unscrew and replace cable W32.

4.1.5.5 Water separator p/n 147 778

Remove *hood (item 90), side cover left (item 91)* and *side cover right item 92* (see section 4.1.4).

Disconnect connector 2302 from connector board W11.

Unscrew the water separator (2 screws on top) and pull it out to the left side.



Now disconnect all tubes from the water separator and unscrew *cable W32 (item 69)*.

After remounting, check that no tubes are kinked!

4.1.6 Spare Parts List

WASHER/DISPENSER MODULE RAW 147 818 Revision: 01

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147634	W/D MODULE FRAME	00	1	1.000	A
147377	DISPENSER	02	2	1.000	
147251	REAGENT DRAWER	01	3	1.000	B
147733	WASHERLIFT	00	4	1.000	B
147488	EXTERNAL PUMP STATION	02	5	1.000	B
146168	MOTHERBOARD W/D PCB	01	20	1.000	C
146172	POWER SUPPLY 2 PCB	04	21	1.000	A
146162	PROCESSOR 2 PCB	01	22	1.000	
146174	STEP MOTOR PCB	00	23	1.000	A
146180	DISPENSER PCB	01	24	1.000	A
146163	PROCESSOR 3 PCB	01	25	1.000	
146182	WASHER PCB	02	26	1.000	A
146288	DC-MOTOR W PM 70	00	40	1.000	B
146290	DC-MOTOR W PM 80	00	41	1.000	B
146242	EL. RACK FAN	00	43	1.000	B
146211	CABLE W1	00	60	1.000	C
146212	CABLE W2	00	61	2.000	C
146214	CABLE W4	00	63	1.000	C
146215	CABLE W5	00	64	1.000	C
146216	CABLE W6	00	65	1.000	C
146287	CABLE W30	00	66	1.000	C
146294	CABLE W40	00	67	1.000	C
146377	CABLE W37	00	68	1.000	
146289	CABLE W32	00	69	1.000	C
147779	ABSCHEIDER-ROHR	00	80	1.000	
147780	ABSCHEIDER-BODEN	00	81	1.000	
281110	STOPFEN D5.8 D7 L5 SILIKON	00	82	1.000	A
147782	ABSCHEIDER-DECKEL	00	84	1.000	
147786	SENSORSTANGE UNTEN	00	85	1.000	
147783	KLEMMSTANGE	00	86	1.000	
147784	SENSORSTANGE KURZ	00	87	1.000	
147785	SENSORSTANGE LANG	00	88	1.000	
147824	EL.RACK GEHAEUSE	01	89	1.000	
147819	HAUBE W/D-MODULE	00	90	1.000	
147820	SEITENBLECH LINKS UNTEN	00	91	1.000	
147789	SEITENBLECH RECHTS	00	92	1.000	
147822	EL.RACK STUETZBL. HI RE	00	93	1.000	
147823	EL.RACK STUETZE	00	94	2.000	
147821	RUECKWANDBLECH	00	95	1.000	
147825	VAKUUMPUMPENHALTER	00	96	1.000	
147581	JUSTIERSCHEIBE	00	99	2.000	A
279649	WINKELSTUECK 90 PP ID 8-9	00	101	3.000	A
279648	WINKELSTUECK 90 PP ID 4-5	00	102	1.000	A
147693	VERBINDUNGSSTUECK NW 8/45	00	103	1.000	A
249944	SCHLAUCHVERBINDER 6/10/6	00	104	2.000	A
147967	SCHLAUCHMANSCHETTE	00	106	1.000	
147994	EL.RACK RUECKWAND	00	108	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
254101	O-RING 85.32x3.53 VITON 75	00	151	2.000	A
255088	KLEBER PCB-POS. W/D-MODULE	00	160	1.000	
255098	KLEBER KABEL-POS. W/D-MODULE	00	161	1.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	162	1.000	
279448	SCHWINGUNGSDAEMPFER D=15 H=20		173	3.000	A
511006	LOCTITE 222 50mL	00	174	0.000	T
361036	KABELHALTER	00	180	3.000	
361016	KABELBEF. 20X20X5 MM	00	181	1.000	
361000	KABELBEF. L=100 B=2.5 MM	00	182	1.000	
361002	KABELBEF. 375 S	00	183	3.000	
361003	KABELBEF. 0250 S	00	184	5.000	
361015	KABELBEF. 3484-1000	00	185	6.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	200	18.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	201	17.000	
400301	ZYL-SCHR.M 4X 6 DIN912 A2	00	202	3.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	203	8.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	204	18.000	
7249057	SILIKONSCHL 4 X 7 TRANSP	00	220	1.290	B
7260010	SILIKONSCHL 8 X12 TRANSP	00	221	2.386	B
255042	WARNZ. BIOGEFAEHRDUNG	00	223	1.000	
361035	KABELHALTER	00	224	1.000	
608299	Q-BESCHEINIGUNG W/D MOD.	02	250	1.000	
608304	TECHN. STAND W/D MOD.	02	251	1.000	
7353011	SCHRUMPFSCHL. RNF3000 4/12	00	252	0.010	
281112	DICHTPROFIL SELBSTK. 6x3MM	00	253	0.300	

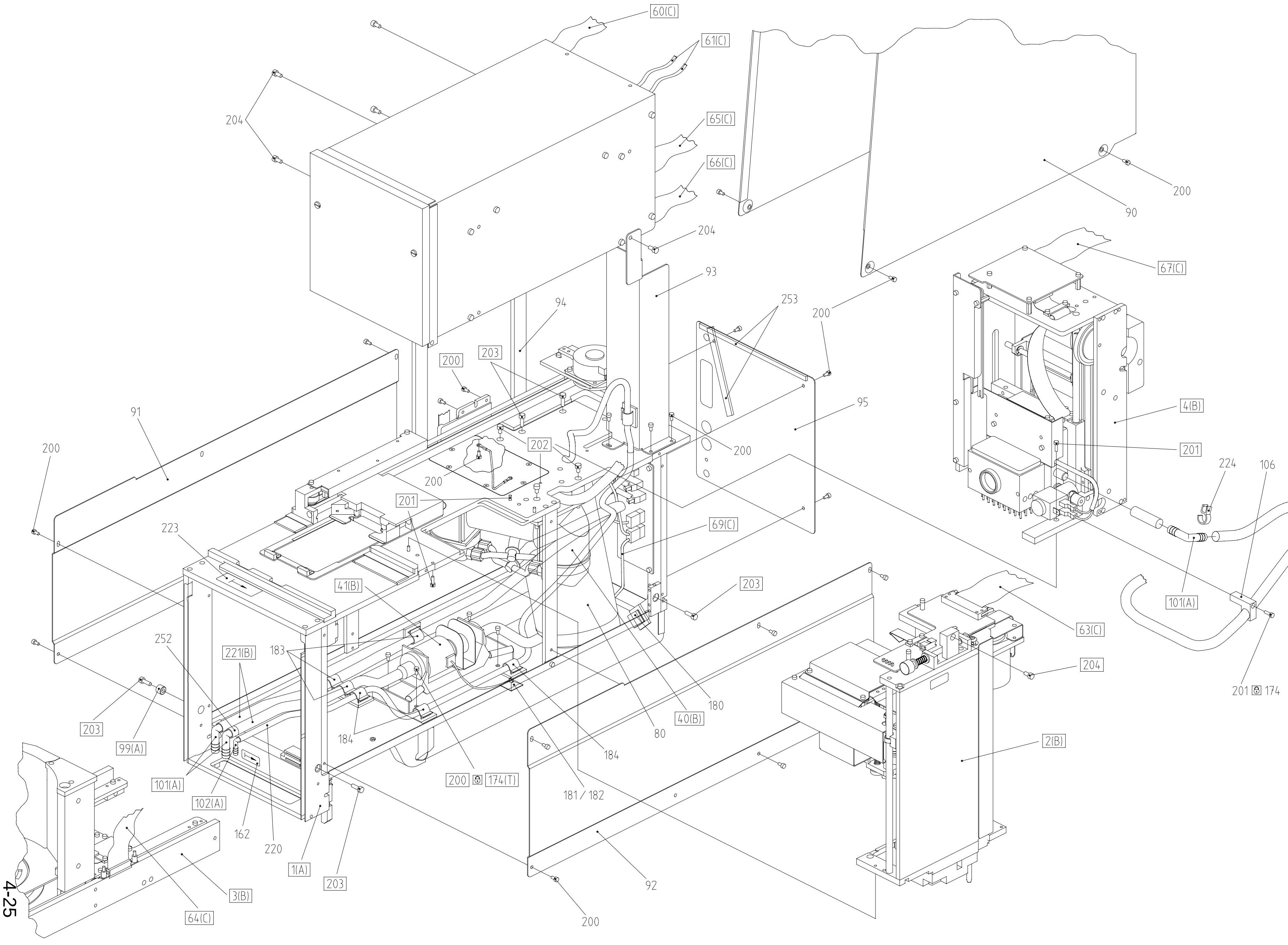
Service Assemblies (parts list 146999)

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147778	WATER SEPARATOR	00		1	B

4.1.7 3D Drawings W / D Module Raw:

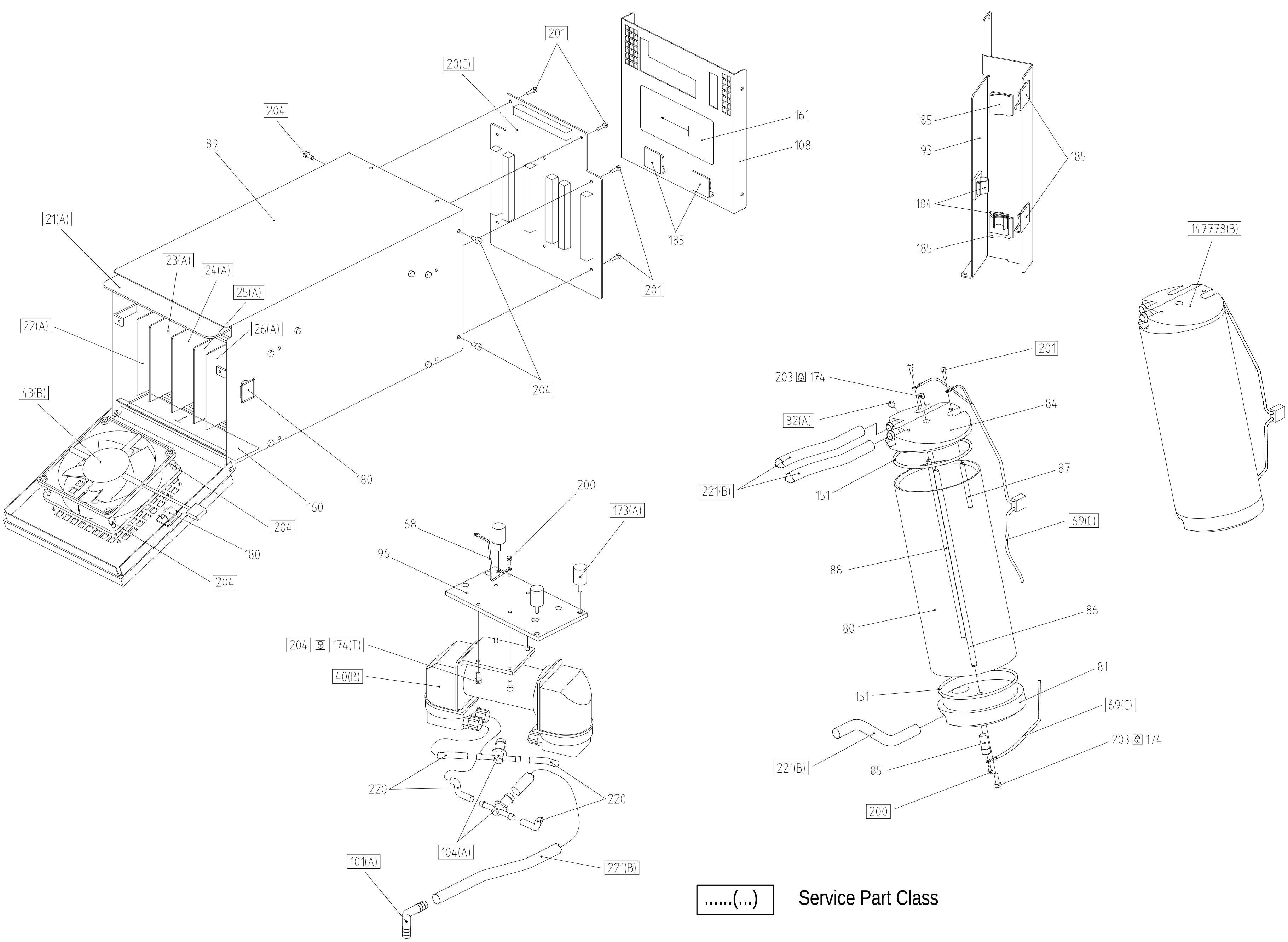
Next two pages

W / D Module Raw (page 2 of 3) 147 818/2 revision 02

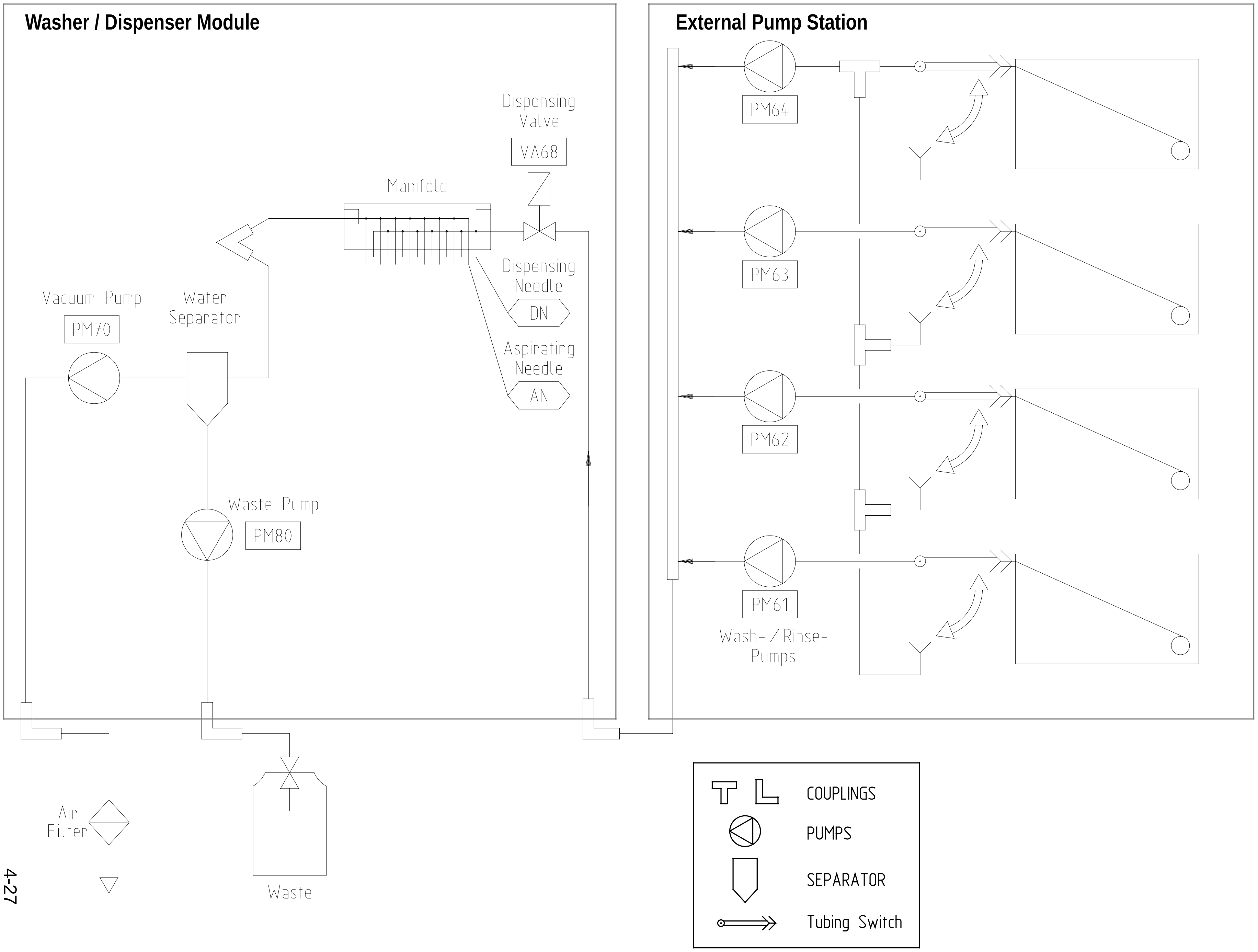

60(C)
61(C)
204
65(C)
66(C)
200
90
204
67(C)
93
94
253
200
203
200
91
95
4(B)
200
202
200
103(A)
201
224
106
200
201
69(C)
223
41(B)
203
63(C)
101(A)
252
221(B)
183
204
201 ⓑ 174
203
99(A)
184
40(B)
180
80
2(B)
184
101(A)
102(A)
200 ⓑ 174(T)
181 / 182
162
220
1(A)
203
92
3(B)
64(C)
200

W / D Module Raw (page 3 of 3)

147 818/1 revision 02

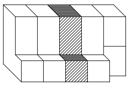

201
20(C)
204
89
161
108
185
93
185
184
185
185
147778(B)
21(A)
23(A)
24(A)
25(A)
22(A)
26(A)
201
204
43(B)
180
160
204
180
204
201
203 174
84
82(A)
221(B)
151
87
69(C)
200
173(A)
68
96
88
80
86
204 174(T)
40(B)
151
81
69(C)
203 174
221(B)
85
220
220
200
104(A)
101(A)
221(B)
......(...)
Service Part Class

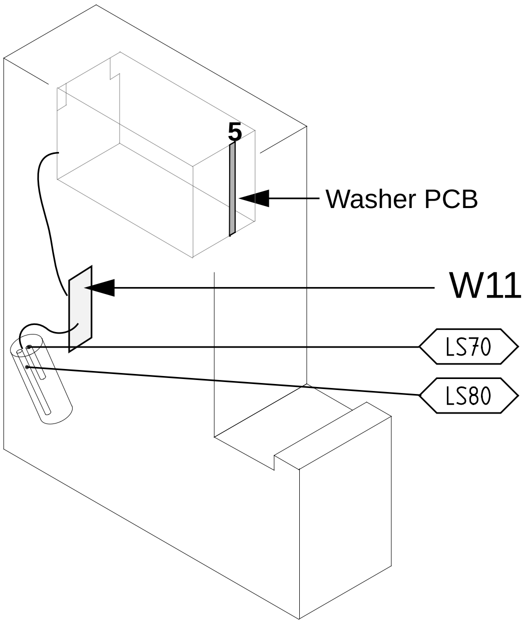
4.1.8 Fluid-Flow Diagram 614148 revision 00 (vd)

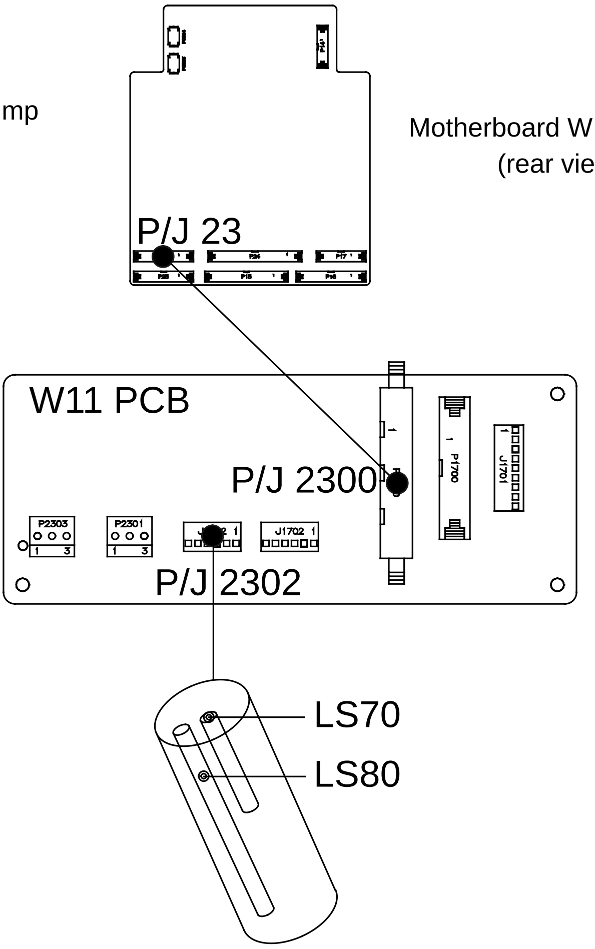

Washer / Dispenser Module
Dispensing Valve
VA68
Manifold
Vacuum Pump
PM70
Water Separator
Dispensing Needle
DN
Aspirating Needle
AN
Waste Pump
PM80
Air Filter
Waste
External Pump Station
PM64
PM63
PM62
PM61
Wash- / Rinse- Pumps
COUPLINGS
PUMPS
SEPARATOR
Tubing Switch

4.1.9 Troubleshooting

Module: Washer / Dispenser
Assembly: Wash / Disp. Module Raw
Sensors: Liquid Level Sensors
LS70 Separator Overflow, Vacuum Pump
LS80 Aspirating Level, Waste Pump
Boards: W11, Washer PCB
Motherboard W / D
Error Message:

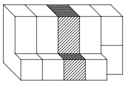


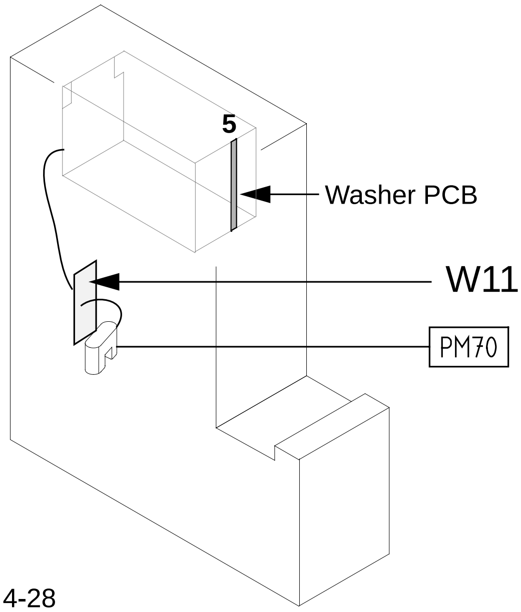

5
Washer PCB
W11
LS70
LS80

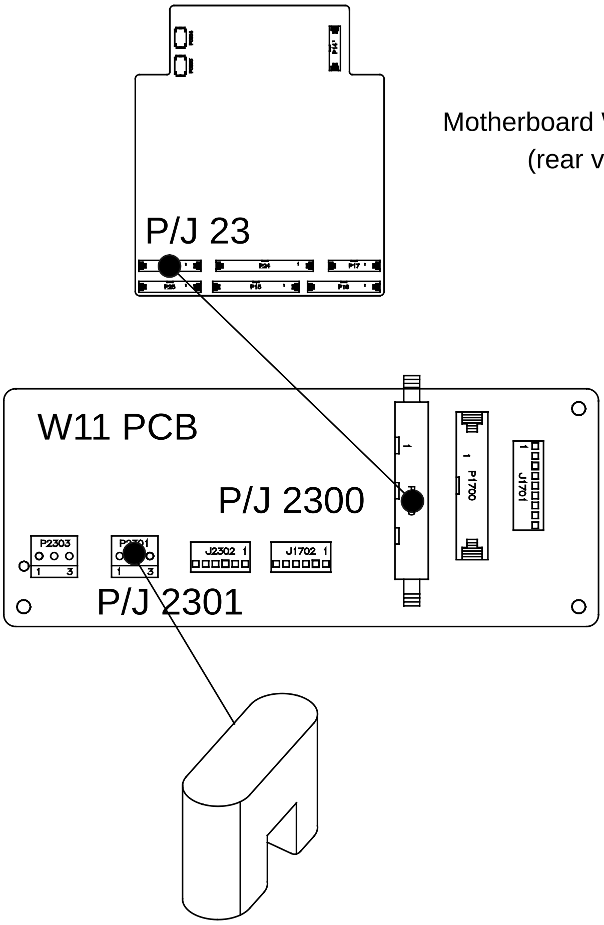

P/J 23
W11 PCB
P/J 2300
P/J 2302
P2303
P2301
J1702
P1700
J1701
LS70
LS80

Motherboard W / D PCB
(rear view)

Module: Washer / Dispenser
Assembly: Wash / Disp. Module Raw
Actor: Pump Motor PM70 Vacuum Pump
Boards: W11, Washer PCB
Motherboard W / D
Error Message:



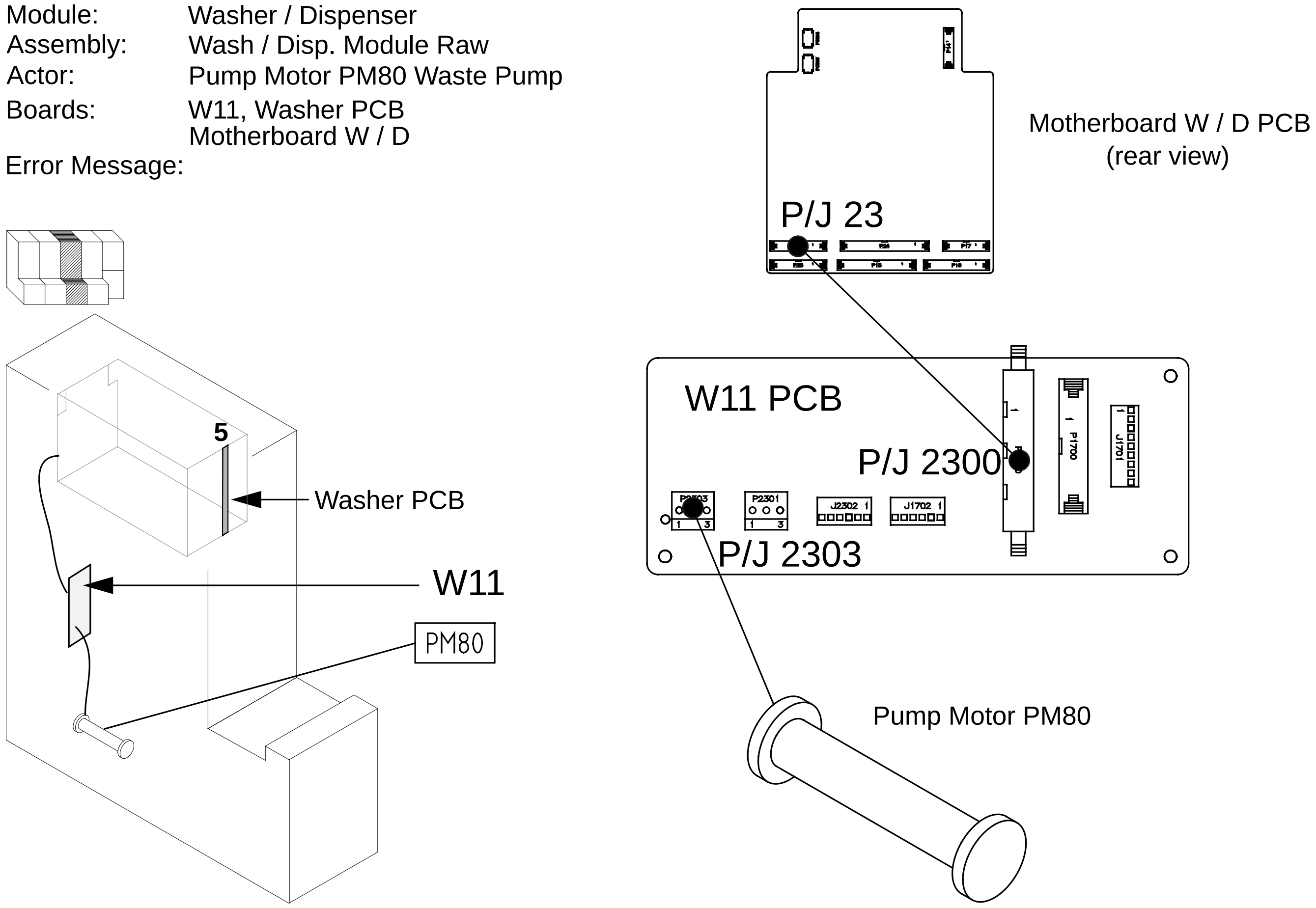

5
Washer PCB
W11
PM70


P/J 23
W11 PCB
P/J 2300
P/J 2301
P2303
P2301
J2302
J1702
P1700
J1701

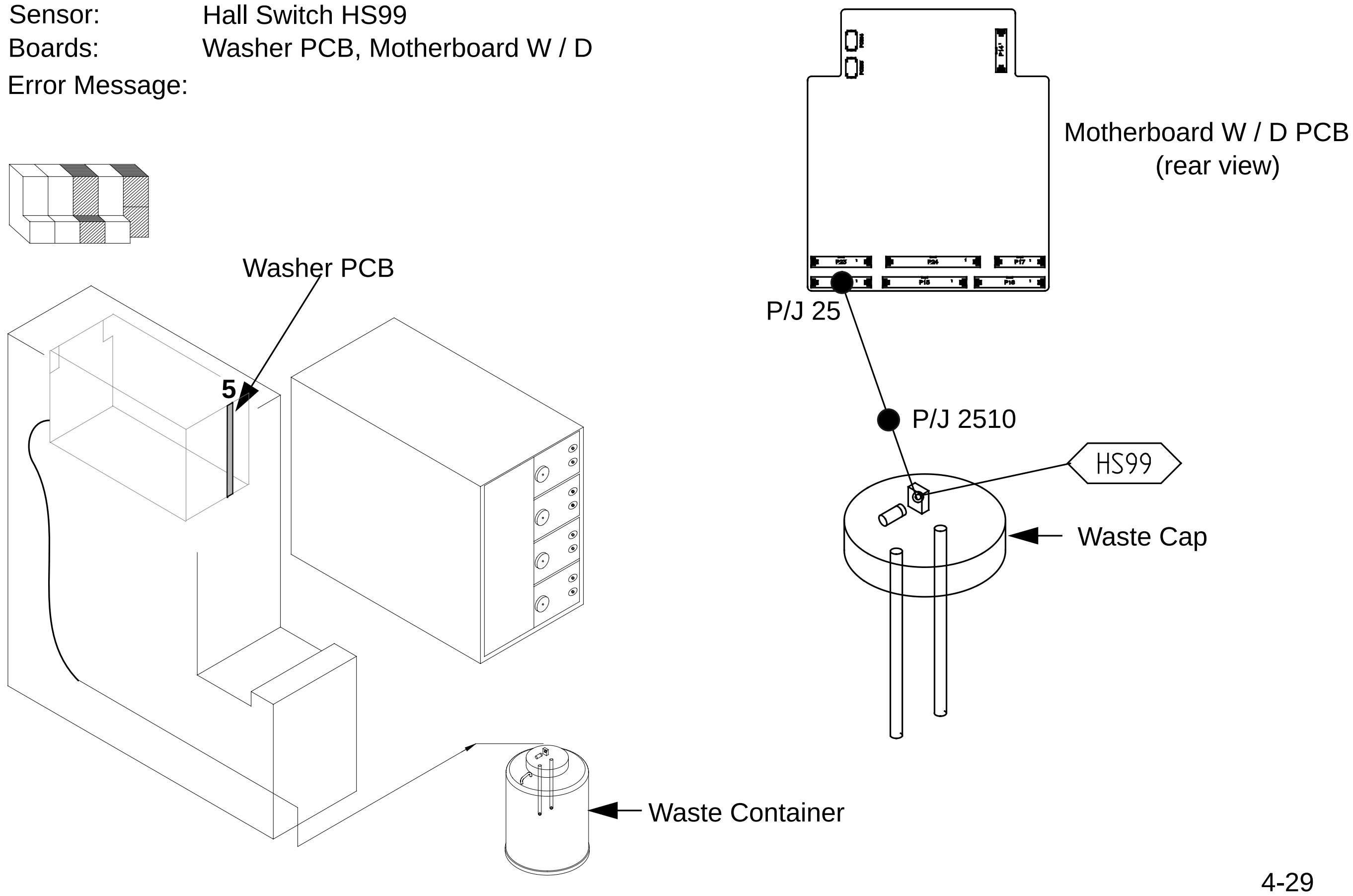
Motherboard W / D PCB
(rear view)

Pump Motor PM70

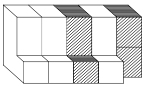
Module: Washer / Dispenser
Assembly: Wash / Disp. Module Raw
Actor: Pump Motor PM80 Waste Pump
Boards: W11, Washer PCB
Motherboard W / D
Error Message:

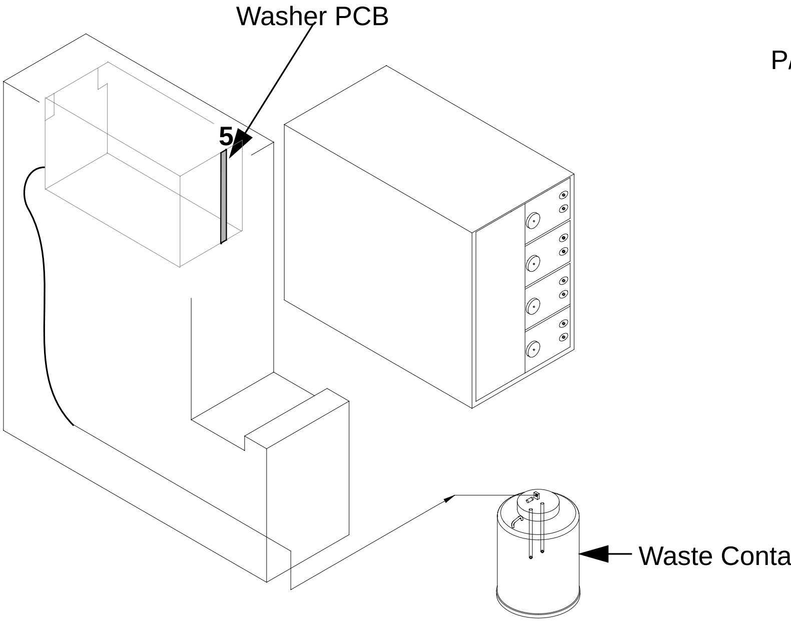

Motherboard W / D PCB
(rear view)
P/J 23
5
Washer PCB
W11
PM80
W11 PCB
P/J 2300
P2303
P2301
J2302
J1702
P1700
J1701
P/J 2303
Pump Motor PM80

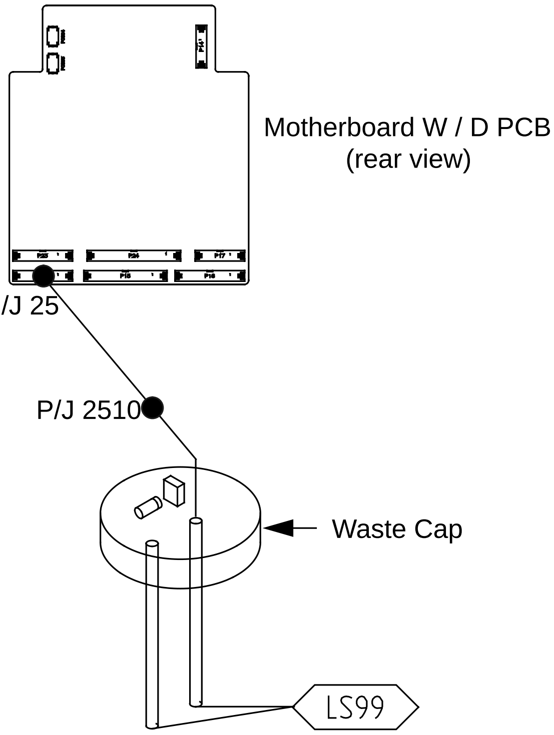
Module: Washer / Dispenser
Assembly: Waste Cap
Sensor: Hall Switch HS99
Boards: Washer PCB, Motherboard W / D
Error Message:


Motherboard W / D PCB
(rear view)
Washer PCB
5
P/J 25
P/J 2510
HS99
Waste Cap
Waste Container

Module: Washer / Dispenser
Assembly: Waste Cap
Sensor: Level Sensor LS99
Boards: Washer PCB, Motherboard W / D
Error Message:




Washer PCB
5
Waste Container


Motherboard W / D PCB
(rear view)
P/J 25
P/J 2510
Waste Cap
LS99

Washer / Dispenser Module Frame

147 634

Functional Description

Connector Boards

I1	146 156	(See Incubator Frame)
W8	146 209	
W11	146 230	
W13	146 234	

Wiring Diagram

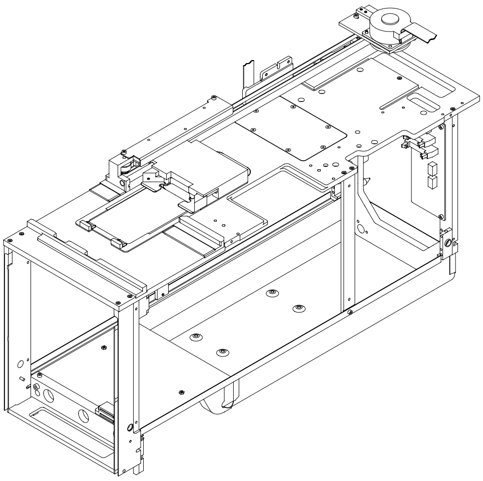
Washer Pumps

Replacing Spare Parts

Spare Parts List

3D Drawing

Troubleshooting

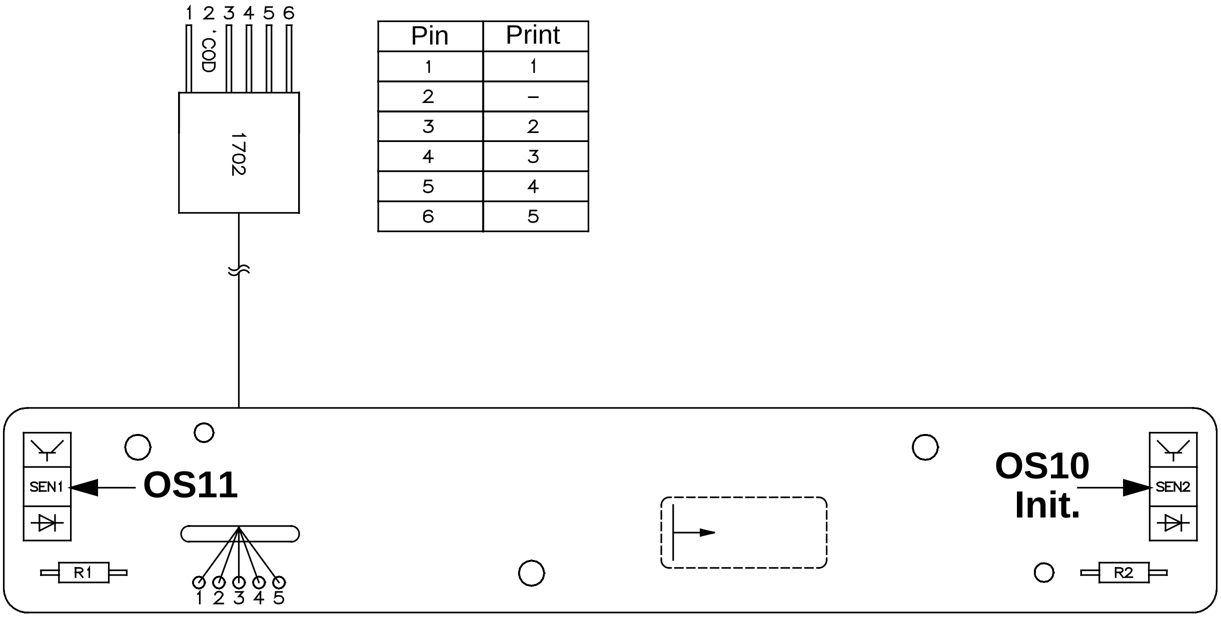


4.2 Washer / Dispenser Module Frame 147 634

4.2.1 Functional Description

4.2.2 Connector Boards

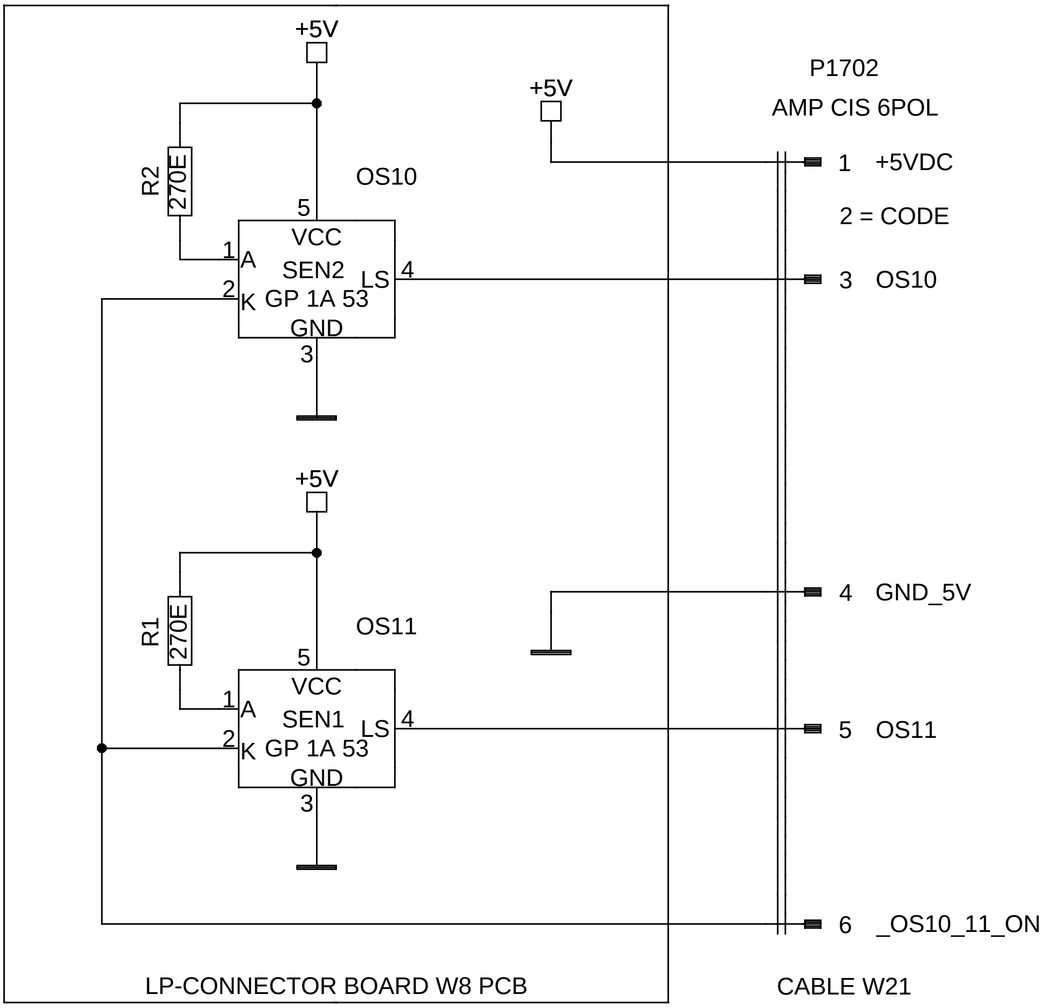
Connector Board W8 PCB Component Layout 146.209 revision 00


1 2 3 4 5 6
COD
1702
SEN1
OS11
R1
1 2 3 4 5
OS10
Init.
SEN2
R2

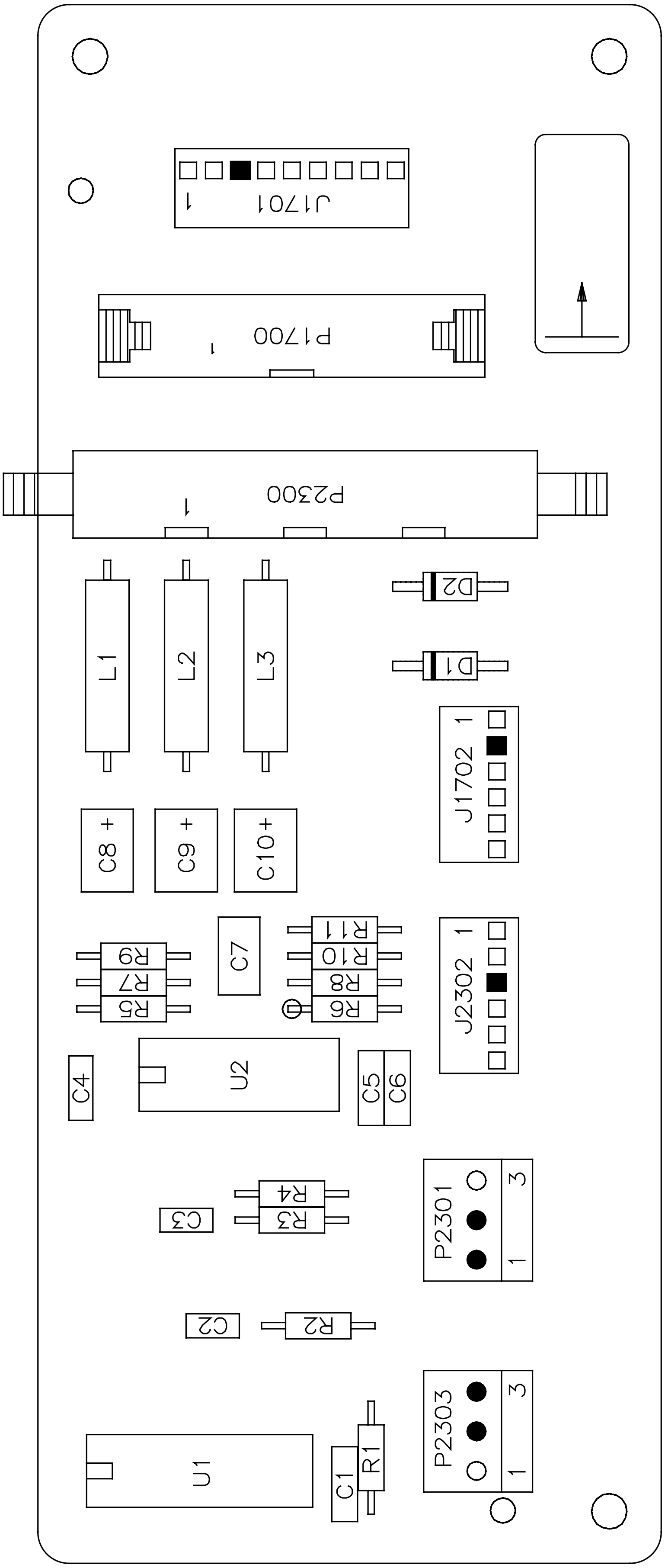
Pin	Print
1	1
2	–
3	2
4	3
5	4
6	5

Connector Board W8 PCB Module Transport Sensors OS10 OS11

Washer & End Modules 604.817 revision 00

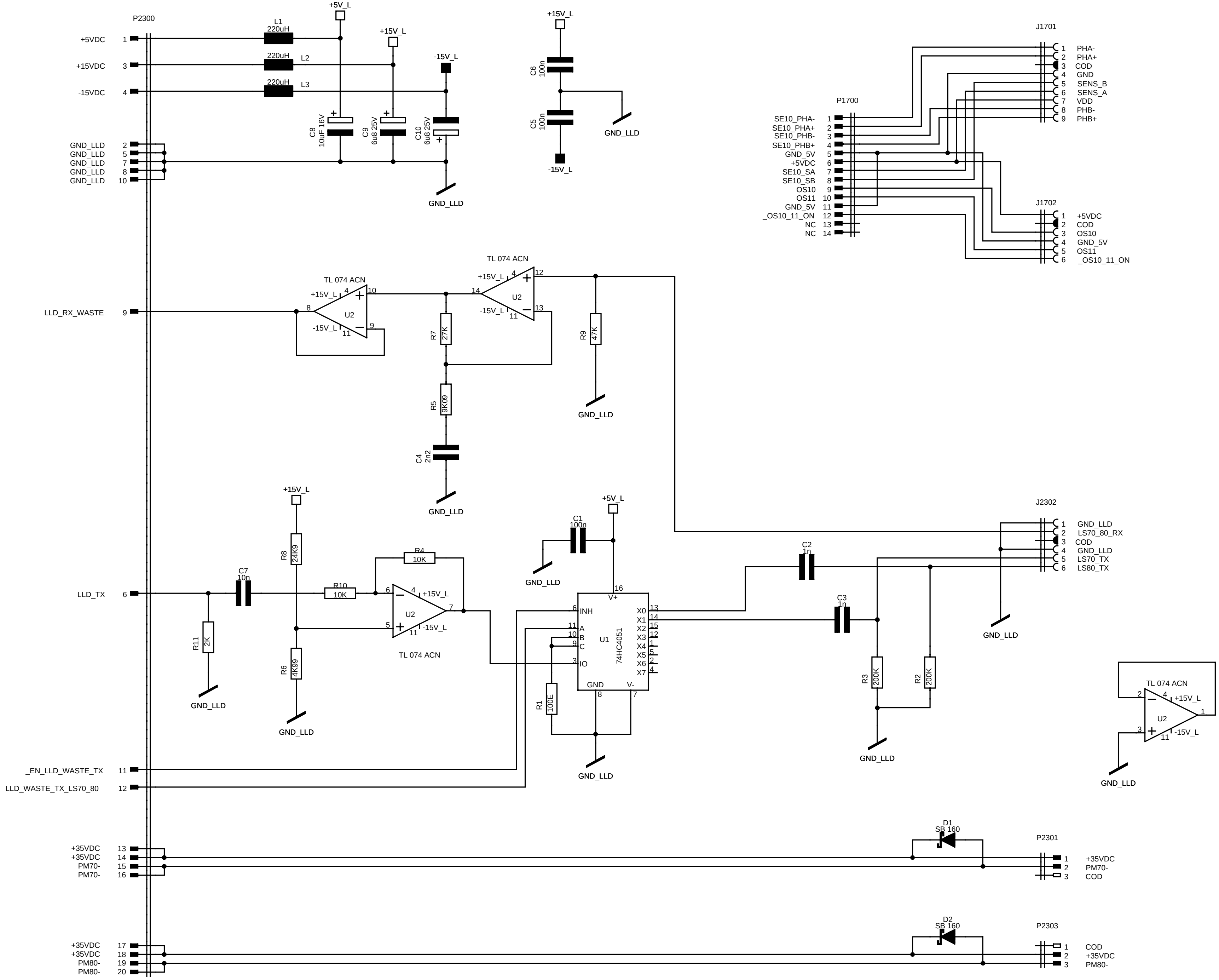

+5V
+5V
R2
270E
OS10
5
VCC
1 A
SEN2
LS 4
2 K
GP 1A 53
GND
3
+5V
R1
270E
OS11
5
VCC
1 A
SEN1
LS 4
2 K
GP 1A 53
GND
3
P1702
AMP CIS 6POL
1 +5VDC
2 = CODE
3 OS10
4 GND_5V
5 OS11
6 _OS10_11_ON
LP-CONNECTOR BOARD W8 PCB
CABLE W21

Connector Board W11 PCB Component Layout 146.230 revision 02

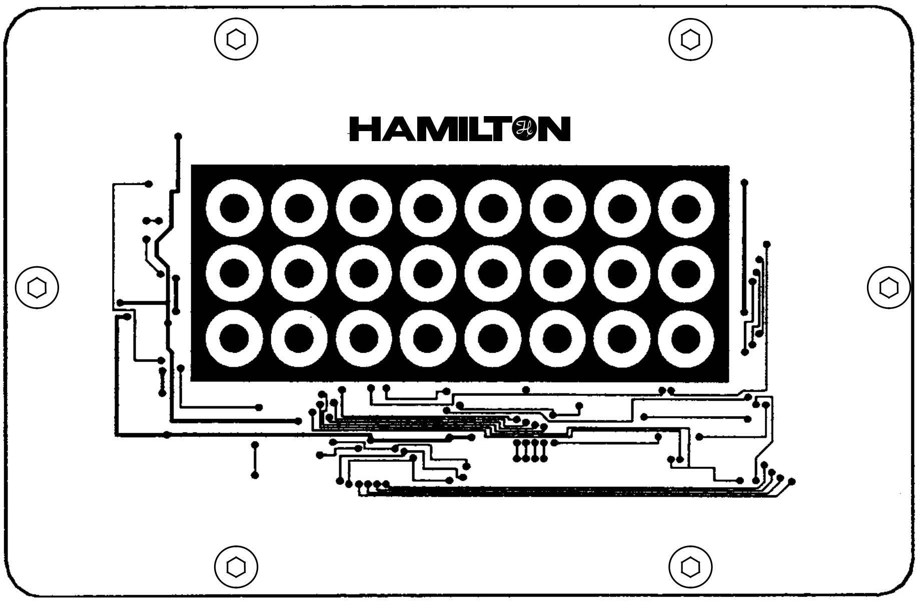

J1701
1
P1700
1
P2300
1
D2
D1
L1
L2
L3
J1702
1
C8 +
C9 +
C10+
R11
R10
R9
R7
R5
C7
R8
R6
J2302
1
C4
U2
C5
C6
P2301
3
1
R4
R3
C3
C2
R2
P2303
3
1
U1
R1
C1

Connector Board W11 PCB

Washer Pumps 604.820 revision 02

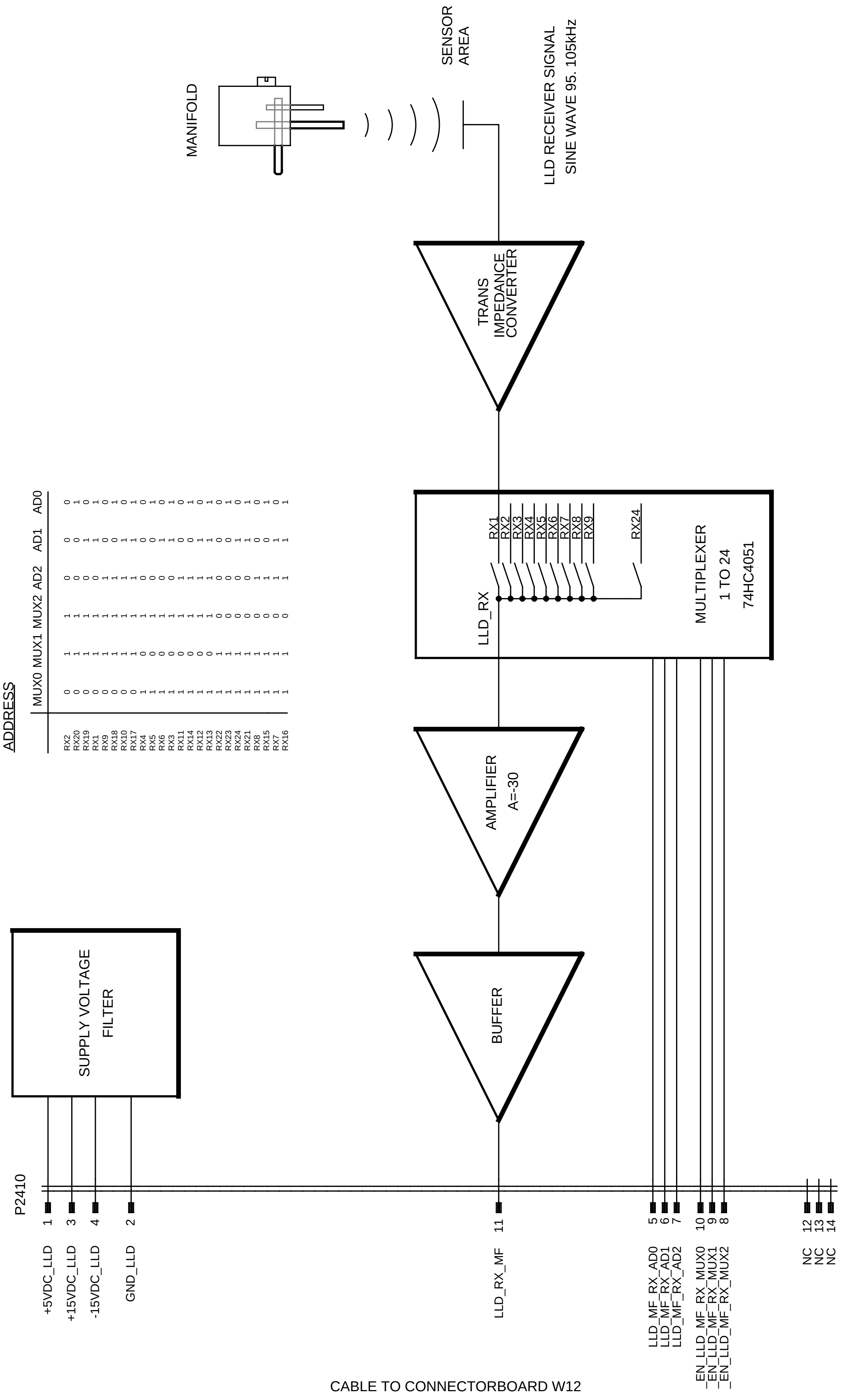

P2300
+5VDC 1
+15VDC 3
-15VDC 4
GND_LLD 2
GND_LLD 5
GND_LLD 7
GND_LLD 8
GND_LLD 10
LLD_RX_WASTE 9
LLD_TX 6
_EN_LLD_WASTE_TX 11
LLD_WASTE_TX_LS70_80 12
+35VDC 13
+35VDC 14
PM70- 15
PM70- 16
+35VDC 17
+35VDC 18
PM80- 19
PM80- 20
L1 220uH
L2 220uH
L3 220uH
+5V_L
+15V_L
-15V_L
C8 10uF 16V
C9 6u8 25V
C10 6u8 25V
C6 100n
C5 100n
GND_LLD
TL 074 ACN
U2
R7 27K
R5 9K09
C4 2n2
R9 47K
R8 24K9
R6 4K99
R11 2K
C7 10n
R10 10K
R4 10K
C1 100n
U1 74HC4051
INH
A
B
C
IO
V+
GND
V-
X0
X1
X2
X3
X4
X5
X6
X7
R1 100E
C2 1n
C3 1n
R3 200K
R2 200K
J1701
1 PHA-
2 PHA+
3 COD
4 GND
5 SENS_B
6 SENS_A
7 VDD
8 PHB-
9 PHB+
P1700
SE10_PHA- 1
SE10_PHA+ 2
SE10_PHB- 3
SE10_PHB+ 4
GND_5V 5
+5VDC 6
SE10_SA 7
SE10_SB 8
OS10 9
OS11 10
GND_5V 11
_OS10_11_ON 12
NC 13
NC 14
J1702
1 +5VDC
2 COD
3 OS10
4 GND_5V
5 OS11
6 _OS10_11_ON
J2302
1 GND_LLD
2 LS70_80_RX
3 COD
4 GND_LLD
5 LS70_TX
6 LS80_TX
D1 SB 160
D2 SB 160
P2301
1 +35VDC
2 PM70-
3 COD
P2303
1 COD
2 +35VDC
3 PM80-

Connector Board W13 PCB 146.234



Block Diagram Connector Board W13 PCB

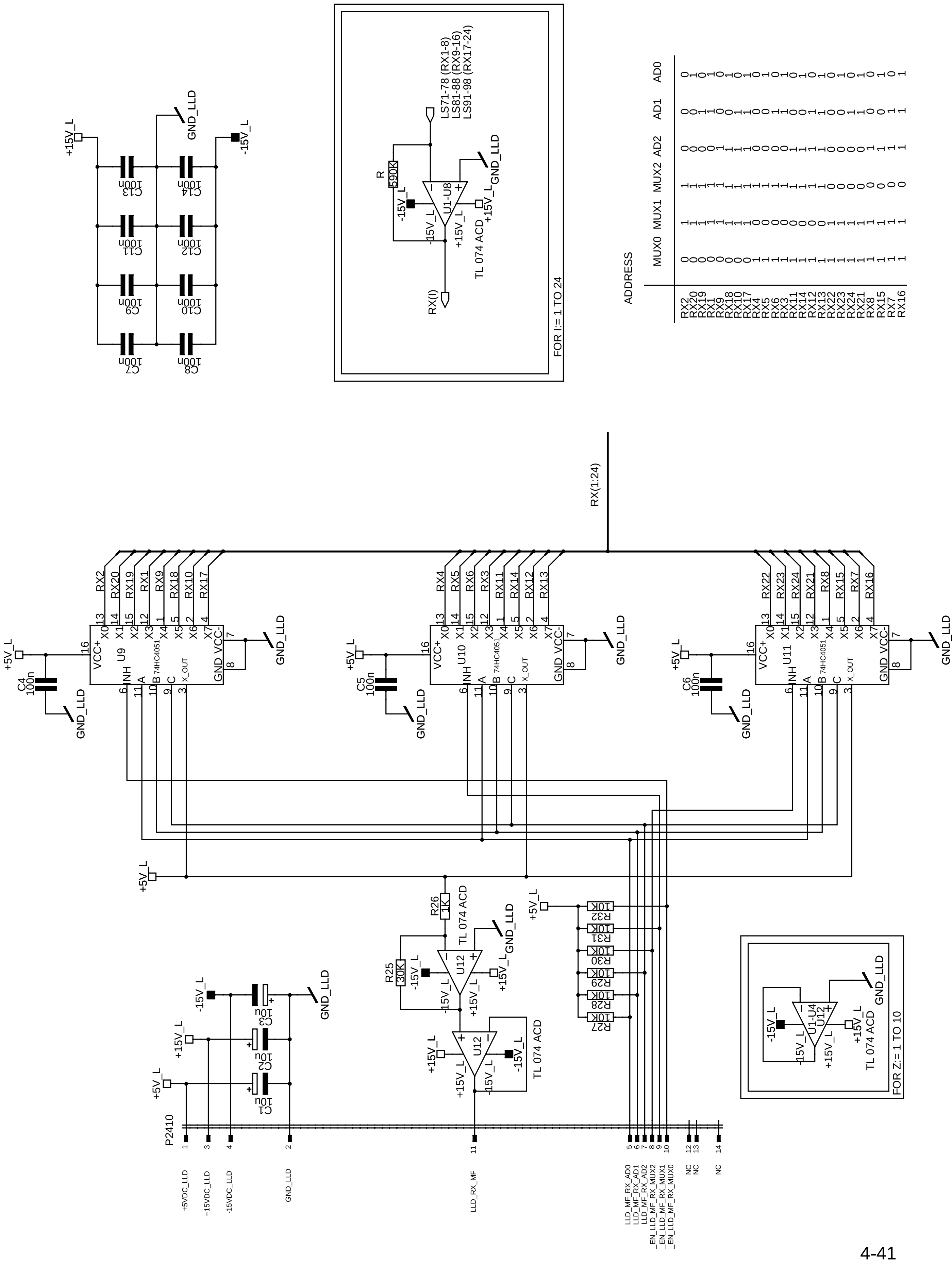
Washer LLD Receiver 614.147 revision 00


MANIFOLD
SENSOR AREA
LLD RECEIVER SIGNAL
SINE WAVE 95. 105kHz
TRANS IMPEDANCE CONVERTER
LLD_RX
RX1
RX2
RX3
RX4
RX5
RX6
RX7
RX8
RX9
RX24
MULTIPLEXER
1 TO 24
74HC4051
AMPLIFIER
A=-30
BUFFER
SUPPLY VOLTAGE FILTER
P2410
1 +5VDC_LLD
3 +15VDC_LLD
4 -15VDC_LLD
2 GND_LLD
11 LLD_RX_MF
5 LLD_MF_RX_AD0
6 LLD_MF_RX_AD1
7 LLD_MF_RX_AD2
10 EN_LLD_MF_RX_MUX0
9 EN_LLD_MF_RX_MUX1
8 EN_LLD_MF_RX_MUX2
12 NC
13 NC
14 NC
CABLE TO CONNECTORBOARD W12

ADDRESS

	MUX0	MUX1	MUX2	AD2	AD1	AD0
RX2	0	1	1	0	0	0
RX20	0	1	1	0	0	1
RX19	0	1	1	0	1	0
RX1	0	1	1	0	1	1
RX9	0	1	1	1	0	0
RX18	0	1	1	1	0	1
RX10	0	1	1	1	1	0
RX17	0	1	1	1	1	1
RX4	1	0	1	0	0	0
RX5	1	0	1	0	0	1
RX6	1	0	1	0	1	0
RX3	1	0	1	0	1	1
RX11	1	0	1	1	0	0
RX14	1	0	1	1	0	1
RX12	1	0	1	1	1	0
RX13	1	0	1	1	1	1
RX22	1	1	0	0	0	0
RX23	1	1	0	0	0	1
RX24	1	1	0	0	1	0
RX21	1	1	0	0	1	1
RX8	1	1	0	1	0	0
RX15	1	1	0	1	0	1
RX7	1	1	0	1	1	0
RX16	1	1	0	1	1	1

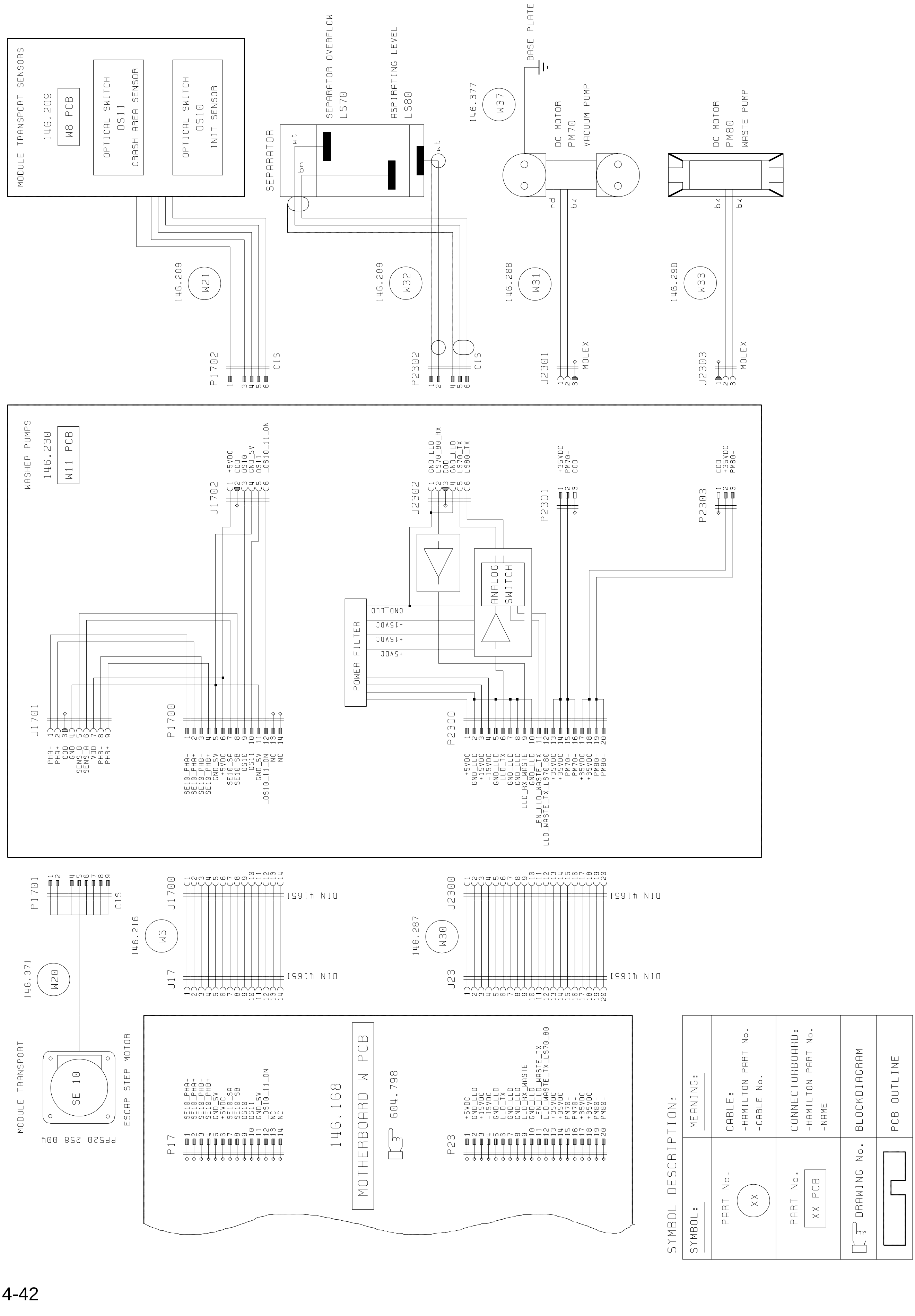
Connector Board W13 PCB Washer LLD Receiver 604.822 revision 00


+15V_L
-15V_L
GND_LLD
C13 100n
C14 100n
C11 100n
C12 100n
C9 100n
C10 100n
C7 100n
C8 100n
LS71-78 (RX1-8)
LS81-88 (RX9-16)
LS91-98 (RX17-24)
R 590K
U1-U8
TL 074 ACD
RX(I)
FOR I:= 1 TO 24
RX(1:24)
U9 74HC4051
U10 74HC4051
U11 74HC4051
VCC+
VCC-
GND
INH
A
B
C
X_OUT
X0 X1 X2 X3 X4 X5 X6 X7
RX2 RX20 RX19 RX1 RX9 RX18 RX10 RX17
RX4 RX5 RX6 RX3 RX11 RX14 RX12 RX13
RX22 RX23 RX24 RX21 RX8 RX15 RX7 RX16
+5V_L
C4 100n
C5 100n
C6 100n
R26 1K
R25 30K
U12
R32 10K
R31 10K
R30 10K
R29 10K
R28 10K
R27 10K
C3 10u
C2 10u
C1 10u
U1-U4 U12
FOR Z:= 1 TO 10
P2410
+5VDC_LLD
+15VDC_LLD
-15VDC_LLD
GND_LLD
LLD_RX_MF
LLD_MF_RX_AD0
LLD_MF_RX_AD1
LLD_MF_RX_AD2
_EN_LLD_MF_RX_MUX2
_EN_LLD_MF_RX_MUX1
_EN_LLD_MF_RX_MUX0
NC

ADDRESS

	MUX0	MUX1	MUX2	AD2	AD1	AD0
RX2	0	1	1	0	0	0
RX20	0	1	1	0	0	1
RX19	0	1	1	0	1	0
RX1	0	1	1	0	1	1
RX9	0	1	1	1	0	0
RX18	0	1	1	1	0	1
RX10	0	1	1	1	1	0
RX17	0	1	1	1	1	1
RX4	1	0	1	0	0	0
RX5	1	0	1	0	0	1
RX6	1	0	1	0	1	0
RX3	1	0	1	0	1	1
RX11	1	0	1	1	0	0
RX14	1	0	1	1	0	1
RX12	1	0	1	1	1	0
RX13	1	0	1	1	1	1
RX22	1	1	0	0	0	0
RX23	1	1	0	0	0	1
RX24	1	1	0	0	1	0
RX21	1	1	0	0	1	1
RX8	1	1	0	1	0	0
RX15	1	1	0	1	0	1
RX7	1	1	0	1	1	0
RX16	1	1	0	1	1	1

4.2.3 **Wiring Diagram** Washer Pumps: Dwg No. 604 499 revision 01


MODULE TRANSPORT SENSORS
146.209
W8 PCB
OPTICAL SWITCH OS11 CRASH AREA SENSOR
OPTICAL SWITCH OS10 INIT SENSOR
SEPARATOR
SEPARATOR OVERFLOW LS70
ASPIRATING LEVEL LS80
wt
bn
BASE PLATE
146.377 W37
DC MOTOR PM70 VACUUM PUMP
rd
bk
DC MOTOR PM80 WASTE PUMP
146.209 W21
146.289 W32
146.288 W31
146.290 W33
P1702
CIS
P2302
J2301
J2303
MOLEX
WASHER PUMPS
146.230
W11 PCB
J1702
+5VDC COD OS10 GND_5V OS11 _OS10_11_ON
J2302
GND_LLD LS70_80_RX COD GND_LLD LS70_TX LS80_TX
P2301
+35VDC PM70- COD
P2303
COD +35VDC PM80-
POWER FILTER
GND_LLD
-15VDC
+15VDC
+5VDC
ANALOG SWITCH
J1701
PHA- PHA+ COD GND SENS_B SENS_A VDD PHB- PHB+
P1700
SE10_PHA- SE10_PHA+ SE10_PHB- SE10_PHB+ GND_5V +5VDC SE10_SA SE10_SB OS10 OS11 GND_5V _OS10_11_ON NC NC
P2300
+5VDC GND_LLD +15VDC -15VDC GND_LLD LLD_TX GND_LLD GND_LLD LLD_RX_WASTE GND_LLD _EN_LLD_WASTE_TX LLD_WASTE_TX_LS70_80 +35VDC +35VDC PM70- PM70- +35VDC +35VDC PM80- PM80-
P1701
CIS
J1700
J2300
DIN 41651
146.216 W6
146.287 W30
J17
J23
146.371 W20
MODULE TRANSPORT
SE 10
ESCAP STEP MOTOR
PP520 258 004
P17
P23
MOTHERBOARD W PCB
146.168
604.798
SYMBOL DESCRIPTION:
SYMBOL:
MEANING:
PART No.
XX
CABLE: -HAMILTON PART No. -CABLE No.
XX PCB
CONNECTORBOARD: -HAMILTON PART No. -NAME
DRAWING No.
BLOCKDIAGRAM
PCB OUTLINE

4.2.4 Replacing spare parts

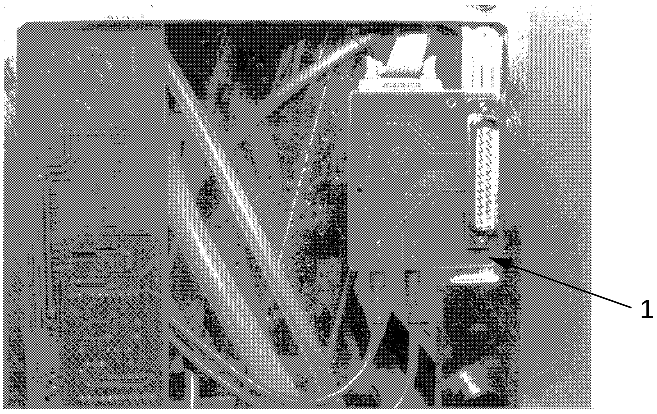
NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

4.2.4.1 Connector board I1 PCB item 1

Remove *rear cover right item 95* (see section 4.1.4).

Disconnect the 3 cables from connector board I1.

Unscrew connector board I1 and replace.

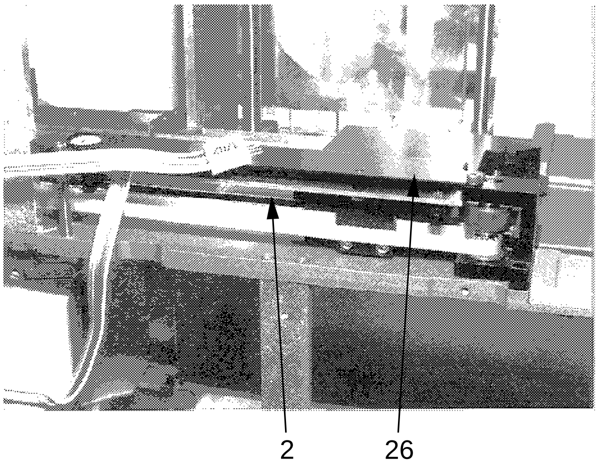


4.2.4.2 Connector board W8 PCB item 2

Remove *hood item 90, side cover left item 91* and *side cover right item 92* (see section 4.1.4).

Disconnect connector 1702 from connector board W11, free cable from cable clamps.

Unscrew the *connector board W8 support item 26* compl. with connector board W8.



Unscrew connector board W8 from connector board W8 support and replace.

After replacing, carry out module transport calibration (see section 1.1.4.3.17):

click check boxes ☑ Washer

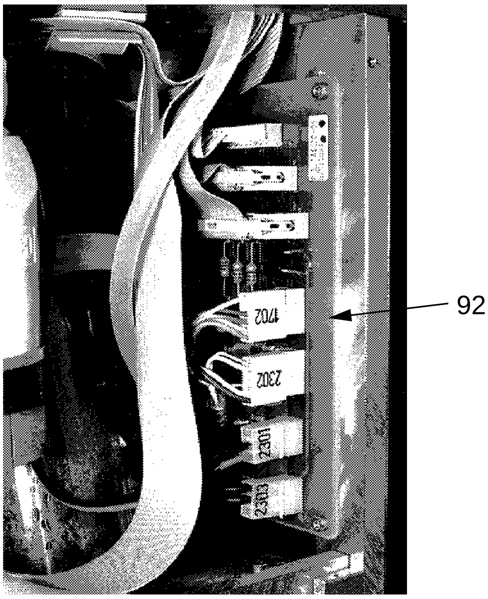
☑ Dispenser

4.2.4.3 Connector board W11 PCB item 3

Remove *side cover right item 92* (see section 4.1.4).

Disconnect all connectors (7).

Unscrew (3 screws) and replace connector board W11.



4.2.4.4 Connector board W13 PCB item 90 and seal item 93

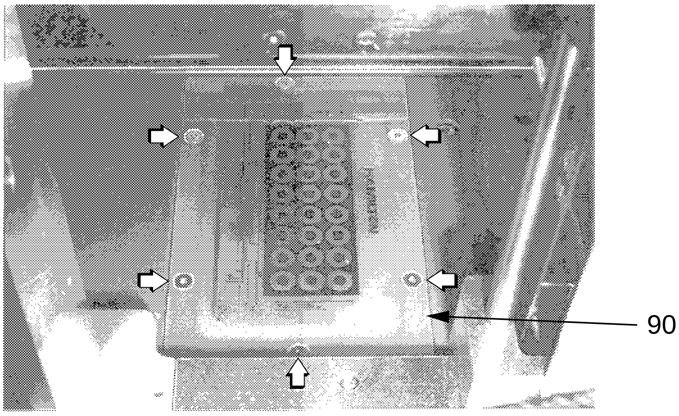
Remove *hood item 90* and *side cover left item 91* (see section 4.1.4).

Push the wash shell all the way up (if it is not already there).

Push the module transport to the front.

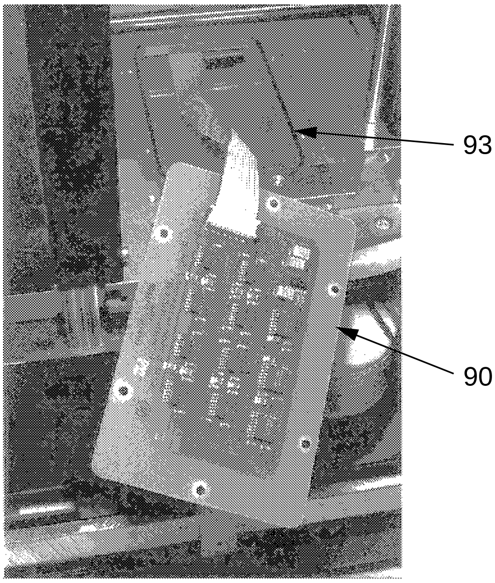
Disconnect *cable W43 item 91* on connector board W12 (washer lift).

Unscrew connector board W13 (6 screws).



Loosen the two screws fixing the *shield item 92* and squeezing *cable W43 item 91*.

Raise connector board W13 slightly by pressing upwards on the connector from underneath and remove it through the right side of the module.

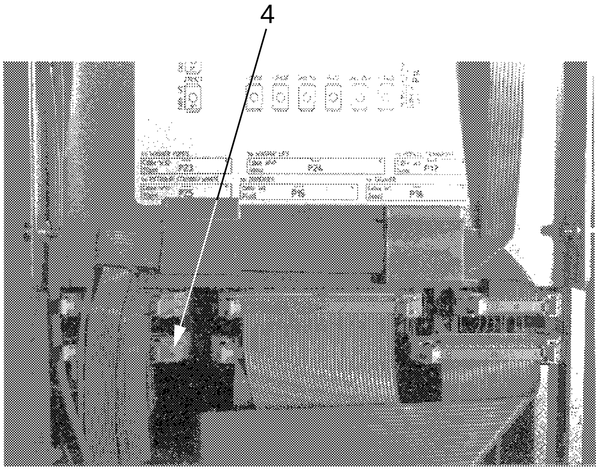


Disconnect the cable W43 from connector board W13.

4.2.4.5 Cable W50 item 4

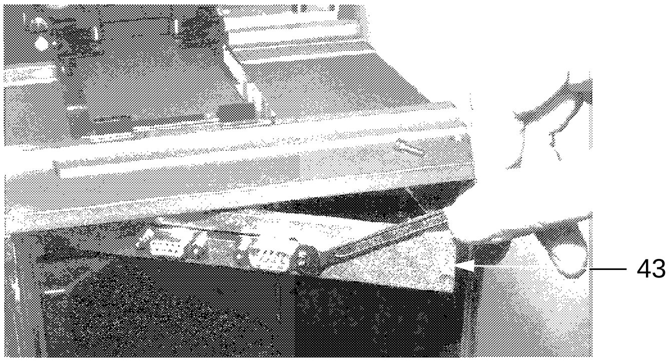
Remove *hood item 90* and *side cover right item 92* (see section 4.1.4).

Disconnect cable W50 from mother board.



Open reagent drawer, unscrew (1 screw) and swing open *connector support item 43*.

Unscrew the two connectors, free the cable from the cable clamps and replace.



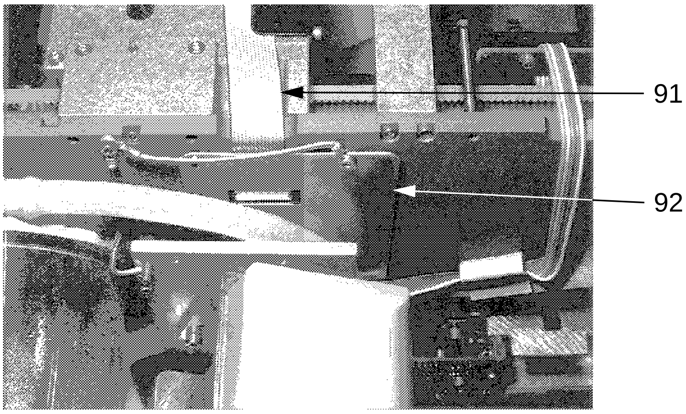
4.2.4.6 Cable W43 item 91

Remove *hood item 90, side cover left item 91* and *side cover right item 92* (see section 4.1.4).

Disconnect cable W43 on connector board W12 on top of the washer lift.

Unscrew and remove shield item 92.

Disconnect cable W43 on connector board W13 and replace.

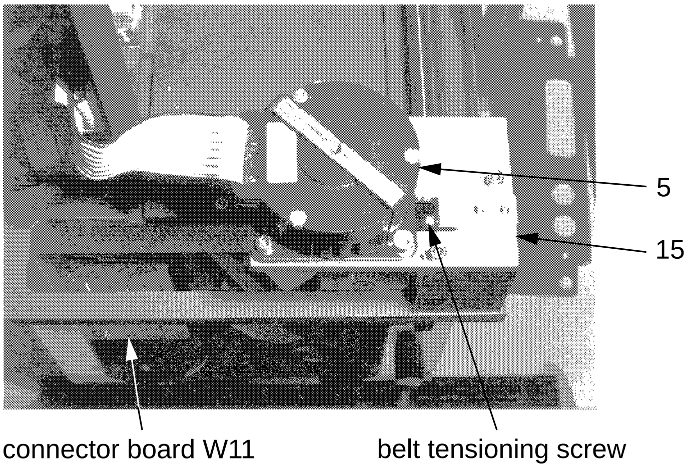


4.2.4.7 Step motor W SE10 item 5

Remove *hood item 90* and *side cover right item 92* (see section 4.1.4).

Disconnect motor on connector board W11.

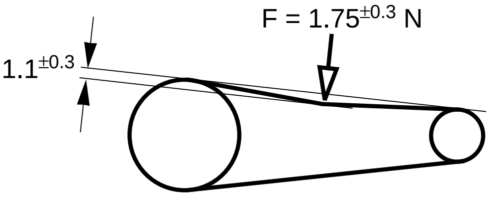
Slacken belt by first loosening *motor support plate item 15* (2 screws) and the belt tensioning screw.


5
15
connector board W11
belt tensioning screw

Slip the belt off the motor pulley.

Unscrew the motor from the motor support plate and replace.

Belt tension:


F = 1.75±0.3 N
1.1±0.3

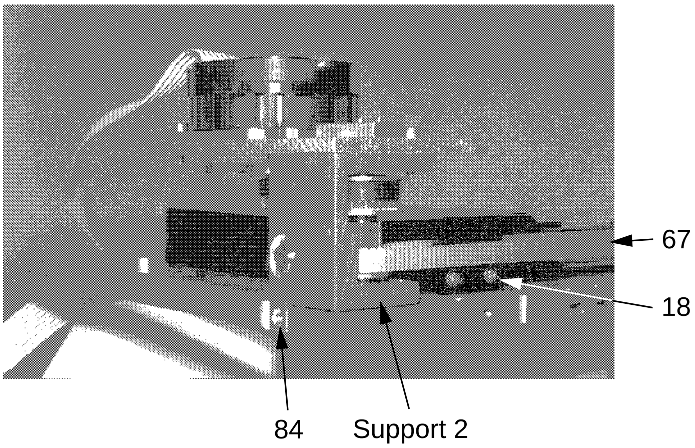
4.2.4.8 Gear belt open item 67

Remove *hood item 90* (see section 4.1.4).

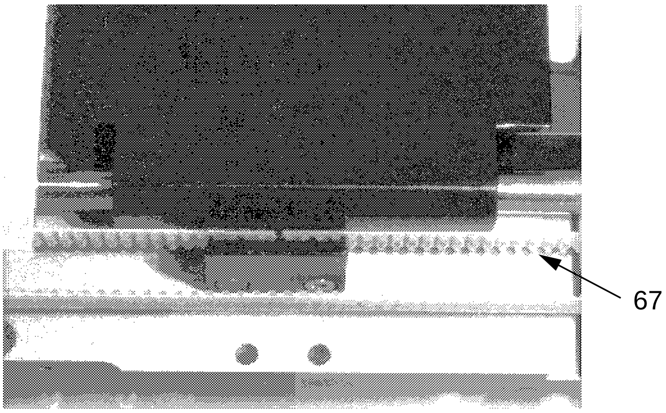
Push the module transport to the back.

Loosen the belt clamp item 18 (2 screws) and remove the belt.

Now slacken the support 2 fixing screw item 82 (from underneath) and the belt tensioning screw item 84.

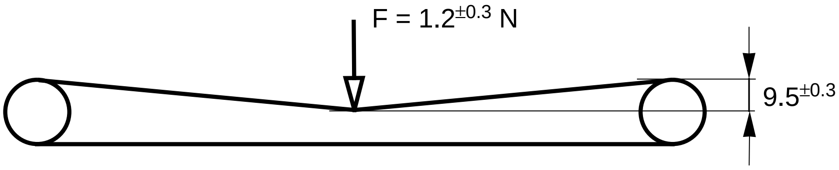


Install the new belt. Clamp as much of the belt ends as possible, see following picture:



Tighten the belt using the belt tensioning screw item 84, then tighten the support 2 fixing screw item 82.

Belt tension:

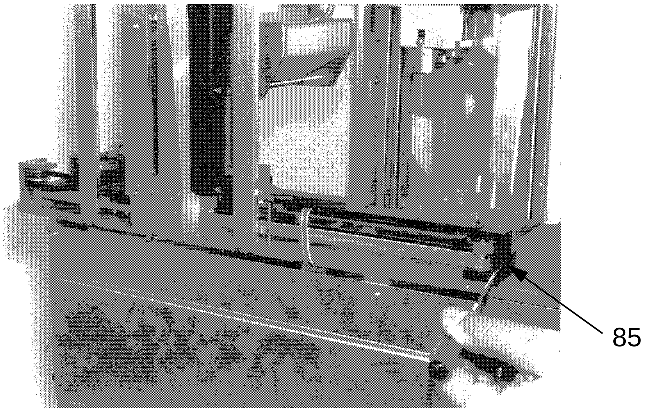


4.2.4.9 Gear belt MXL item 68

Remove *hood item 90* (see section 4.1.4).

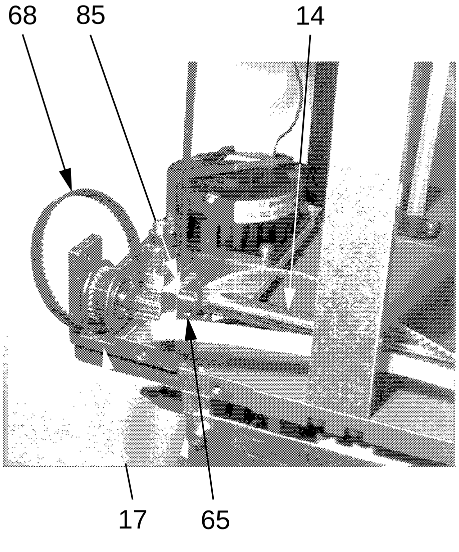
Unscrew the *motor support plate item 15* (2 screws).

Slacken the guide shaft 2 fixing *set screw item 85* and push the *guide shaft 2 item 14* approx. 10 mm ($^1/_2$”) to the front.



Unscrew *support 2 item 17* (1 screw from underneath).

Slacken *set screw item 85* locking *shaft item 65* and push out the shaft, replace the gear belt.



Remounting:

Make sure that *shaft item 65* is flush with the bottom of *support 2 item 17* and *guide shaft 2 item 14* in front with *support 1 item 16* (shaft must not stick out!).

Belt tension: refer to section 4.2.4.7.

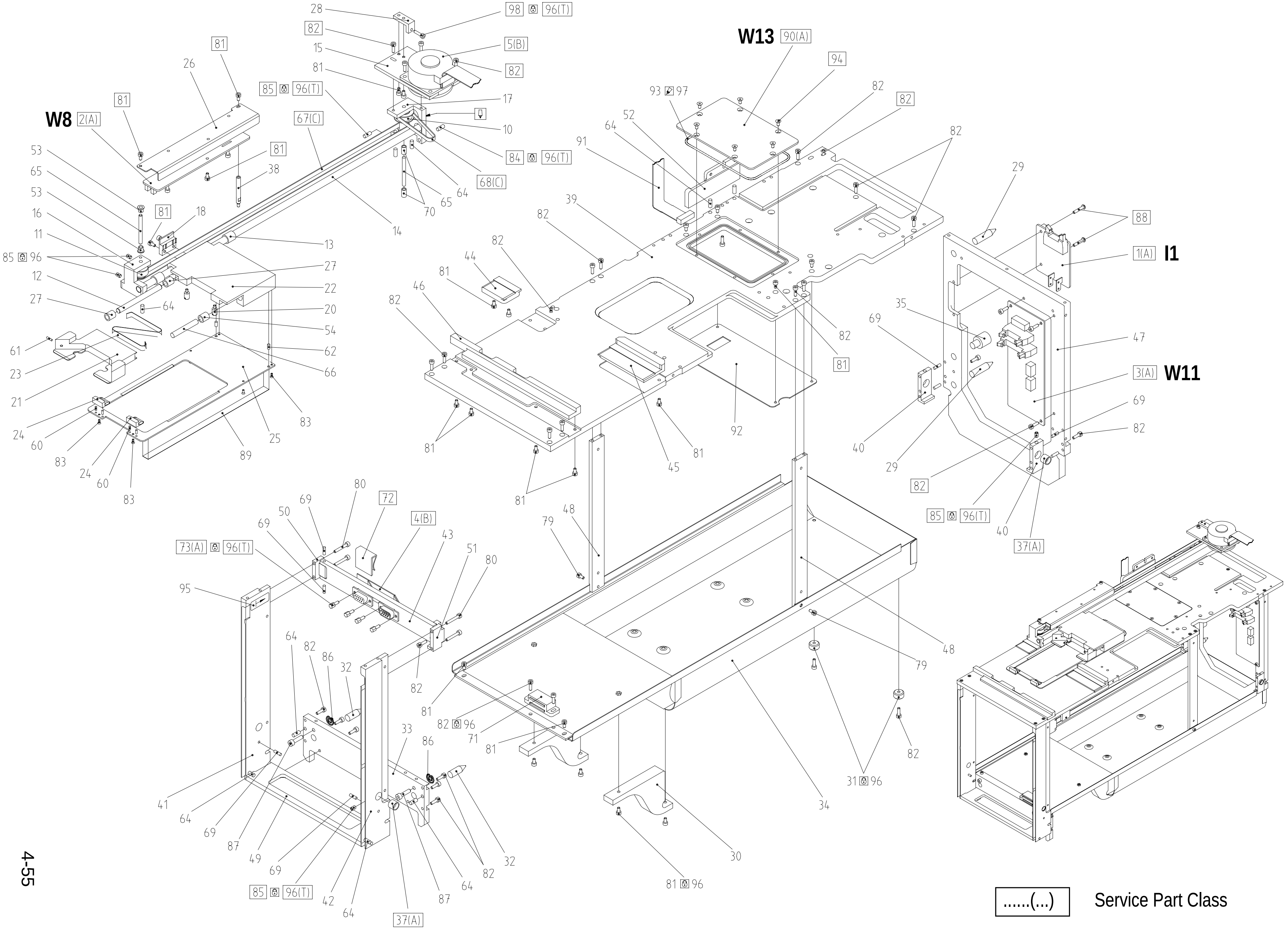
4.2.5 Spare Parts List

WASHER / DISPENSER MODULE FRAME 147634 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
146156	CONNECTORBOARD I1 PCB	00	1	1.000	A
146209	CONNECTORBOARD W8 PCB	00	2	1.000	A
146230	CONNECTORBOARD W11 PCB	00	3	1.000	A
146300	CABLE W50	00	4	1.000	B
146371	STEP MOTOR W SE10	00	5	1.000	B
147191	ZAHNRIEMENRAD 1	00	10	1.000	
147193	RITZEL 2	00	11	1.000	
147198	FUEHRUNGSWELLE 1	00	12	1.000	
147199	GLEITLAGER 2 BEARBEITET	00	13	2.000	
147200	FUEHRUNGSWELLE 2	00	14	1.000	
147201	MOTORPLATTE	00	15	1.000	
147202	SUPPORT 1	00	16	1.000	
147203	SUPPORT 2	00	17	1.000	
147204	KLEMMSTUECK	00	18	1.000	
147206	ANSCHLAG	00	20	2.000	
147207	SCHLITTEN UNTERTEIL	01	21	1.000	
147208	SCHLITTEN OBERTEIL	00	22	1.000	
147209	BLATTFEDER	00	23	1.000	
147210	NOCKEN	00	24	2.000	
147211	GRUNDBLECH BEARB.	00	25	1.000	
147212	TRAGBLECH BOARD W8	00	26	1.000	
147215	GLEITLAGER 1 BEARBEITET	00	27	2.000	
147216	WINKEL	00	28	1.000	
147336	POSITIONIERSTIFT HINTEN	00	29	2.000	
147345	KUFE	00	30	2.000	
147346	ANSCHLAG HINTEN	00	31	2.000	
147348	POSITIONIERSTIFT VORNE	00	32	2.000	
147531	MODULTRAEGER 2	00	33	1.000	
147532	BODEN W/D MODUL	00	34	1.000	
147573	CODE BOLZEN	00	35	1.000	
147581	JUSTIERSCHEIBE	00	37	2.000	A
147585	DISTANZBOLZEN	00	38	1.000	
147623	BASISPLATTE	00	39	1.000	
147625	SUPPORT 5	00	40	2.000	
147626	TREAGER W/D LINKS	00	41	1.000	
147627	TRAGER W/D RECHTS	00	42	1.000	
147628	BEGRENZLEISTE 1	00	43	1.000	
147629	GLEITBAHN 5	00	44	1.000	
147630	GLEITBAHN 6	00	45	1.000	
147632	FUEHRUNGSLEISTE 3	00	46	1.000	
147633	RUECKWAND	00	47	1.000	
147635	STUETZE MITTE	00	48	2.000	
148182	GRIFFPLATTE 2	00	49	1.000	
148219	SCHARNIER 1	00	50	1.000	
148220	RAMPE 1	00	51	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147689	WASHERLIFT-SOCKEL	00	52	1.000	
148258	FLANSCHBUECHSE	00	53	2.000	
148334	FUEHRUNGSBUECHSE	00	54	1.000	
251901	ZYL-STIFT 2 X 5 VSM12771B	00	60	4.000	
251903	ZYL-STIFT 2 X 8 VSM12771B	00	61	1.000	
251920	ZYL-STIFT 3 X 6 VSM12771B	00	62	2.000	
251932	ZYL.STIFT 4 X10 VSM12771B	00	64	9.000	
251939	ZYL-STIFT 4 X40 VSM12771B	00	65	2.000	
251960	ZYL-STIFT 6 X40 VSM12771B	00	66	1.000	
258065	ZAHNRIEMEN SYN-FLEX Z=362X6	00	67	1.000	C
258066	ZAHNRIEMEN MXL Z= 79 X 3/16”	00	68	1.000	C
279250	ZYL-STIFT 3.0X10 VSM12771B	00	69	10.000	
279356	GLEITLAGER ZYL. 4X 5,5 X10	00	70	2.000	
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	71	1.000	C
361015	KABELBEF. 3484-1000	00	72	5.000	
369038	VERRIEGELUNGSMUTTER	00	73	4.000	B
400261	ZYL-SCHR.M 3X 5 DIN912 A2	00	79	2.000	
400009	ZYL-SCHRAUBE M 3 X20 DIN912	00	80	4.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	81	34.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	82	34.000	
403212	SENKSCHRAUBE M2 X 5 DIN963A	00	83	6.000	
405225	GEW.STIFT M 4X10 VERZ DIN914	00	84	1.000	
405462	GEW.STIFT M4 X 5 VERZ DIN916	00	85	5.000	
413045	RINGFEDER SCHWARZ NR.5 BN816	00	86	2.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	87	2.000	
420331	LINSENSCHR M3 X16 ISO7380	00	88	2.000	
7281149	PTFE-KLEBEBAND EXTR.B=9MM	00	89	0.240	
146234	CONNECTORBOARD W13 PCB	00	90	1.000	A
146297	CABLE W43	00	91	1.000	
147965	ABSCHIRMBLECH	00	92	1.000	
254120	O-RING 105x2 VITON 75	00	93	1.000	
403452	SENKSCHRAUBE M 3X 6 DIN7991	00	94	6.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	95	1.000	
511006	LOCTITE 222 50mL	00	96	0.000	T
511030	SICOMET 77	00	97	0.000	
400265	ZYL-SCHR.M 3X12 DIN912 A2	00	98	1.000	
255385	IDENTIFIKATIONSLABEL ORANGE	00	150	1.000	

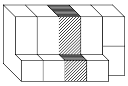
4.2.6 3D Drawing Washer / Dispenser Frame 147 634 revision 04

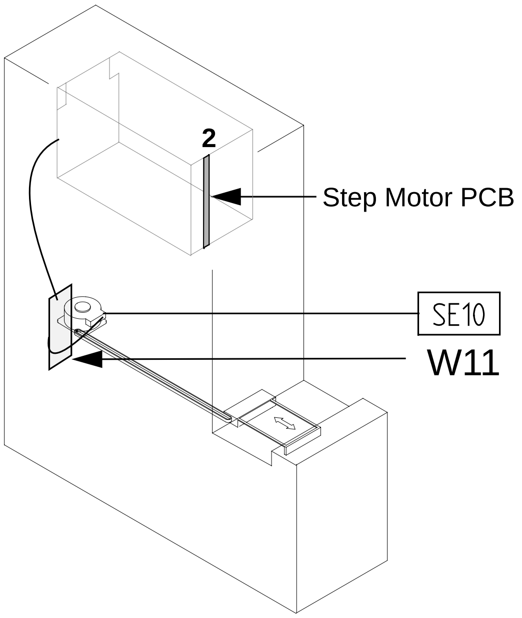

28
98 96(T)
82
5(B)
15
82
81
85 96(T)
17
67(C)
10
84 96(T)
68(C)
64
65
70
14
13
W13 90(A)
94
93 97
82
82
52
64
91
82
29
88
1(A) I1
39
82
82
44
81
46
82
35
69
47
3(A) W11
69
82
82
81
40
29
82
85 96(T)
40
37(A)
45
92
81
81
81
81
W8 2(A)
81
26
81
81
53
65
53
16
11
85 96
12
27
61
23
21
24
60
83
24
60
83
38
81
18
27
22
20
54
62
66
64
25
83
89
80
72
69
50
4(B)
69
43
73(A) 96(T)
51
80
95
48
79
79
48
64
82
86
32
82
81
82 96
71
81
33
86
41
64
69
87
49
69
85 96(T)
42
64
37(A)
87
64
82
32
34
31 96
82
30
81 96

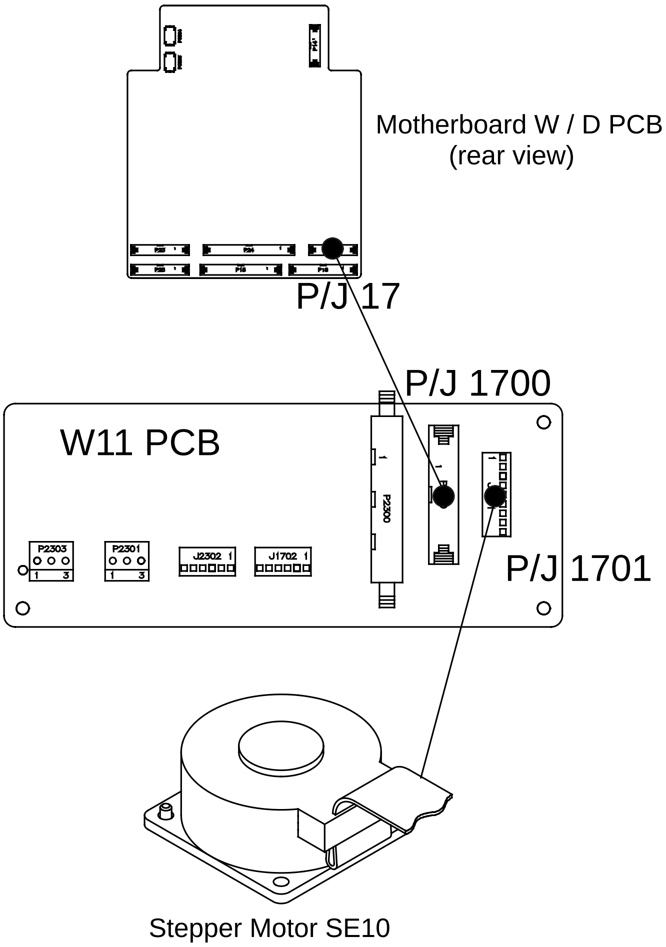
......(...) Service Part Class

4.2.7 Troubleshooting

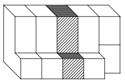
Module: Washer / Dispenser
Assembly: Washer / Dispenser Module Frame
Actor: Stepper Motor with integrated Encoder
SE10 Module Transport
Boards: W11, Step Motor PCB
Motherboard W / D
Error Message:

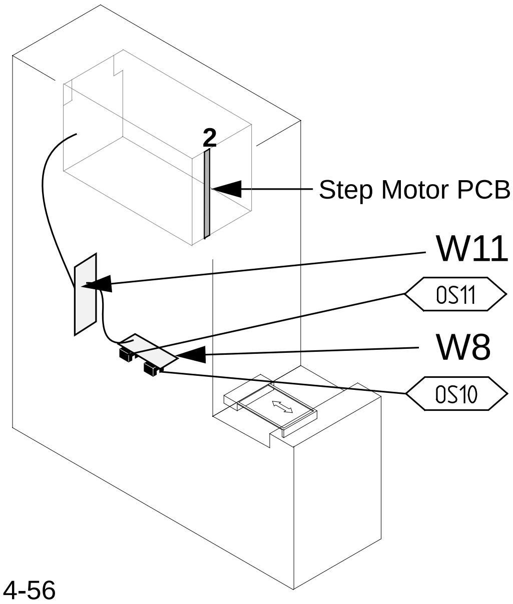


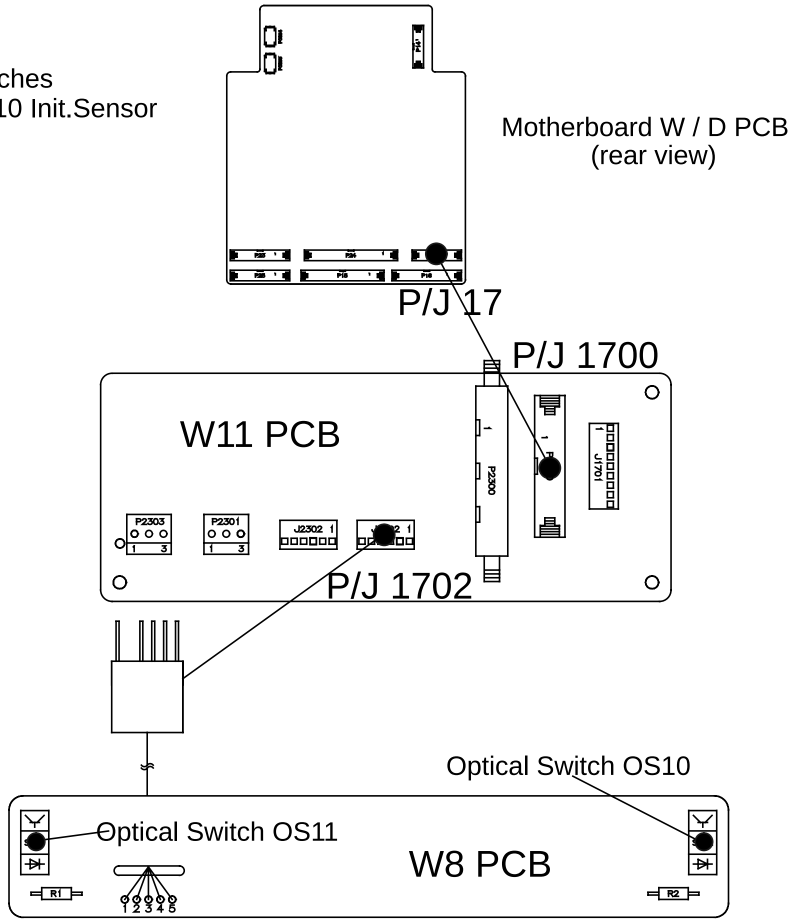

2
Step Motor PCB
SE10
W11


Motherboard W / D PCB
(rear view)
P/J 17
P/J 1700
W11 PCB
P2303
P2301
J2302
J1702
P2300
P/J 1701
Stepper Motor SE10

Module: Washer / Dispenser
Assembly: Wash / Disp. Module Frame
Sensors: Module Transport Optical Switches
OS11 Crash Area Sensor, OS10 Init.Sensor
Boards: W11, W8, Step Motor PCB
Motherboard W / D
Error Message:




2
Step Motor PCB
W11
OS11
W8
OS10


Motherboard W / D PCB
(rear view)
P/J 17
P/J 1700
W11 PCB
P2303
P2301
J2302
P2300
J1701
P/J 1702
Optical Switch OS10
Optical Switch OS11
W8 PCB
R1
R2
1 2 3 4 5

Dispenser

147 377

Functional Description

Connector Boards

W5	146 407*
W6	146 407*
W9	146 256

*(Dispenser serial no. 1349 and higher)

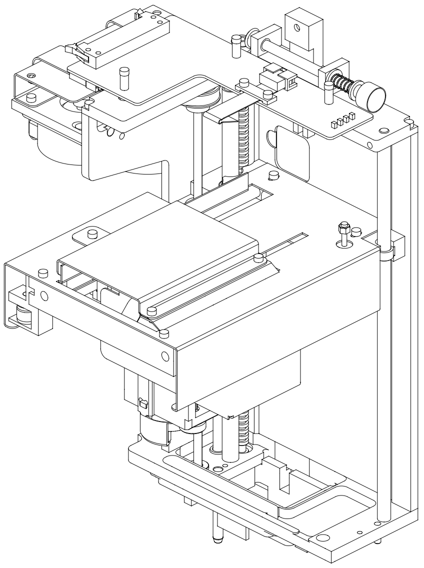
Wiring Diagram

Replacing Spare Parts

Spare Parts List

3D Drawing

Troubleshooting



4.3 Dispenser 147 377

Dispensers serial no. 1001--1348 are equipped with a syringe tip detector (OS 28) on connector board W7 PCB (see service manual V1.0). Dispensers with serial no. 1349 and higher detect syringes via a sensor in the tip clamp.

All syringes are individually inspected during manufacturing. Syringe tip detection is therefore not necessary in the instrument. Connector board W7 PCB has been eliminated and the ‘syringe present’ sensor is now on connector board W6 PCB.

If any of the parts listed in the table below need to be replaced, the whole dispenser must be upgraded (order the Dispenser Upgrade-Kit p/n 148394).

P/N	DESCRIPTION	REVISION	ITEM	SPARE PART CLASS
146207	CONNECTORBOARD W7 PCB	01	93	A
146205	CONNECTORBOARD W6 PCB	01	101	A
146203	CONNECTORBOARD W5 PCB	00	108	A
146217	CABLE W7	00	109	A

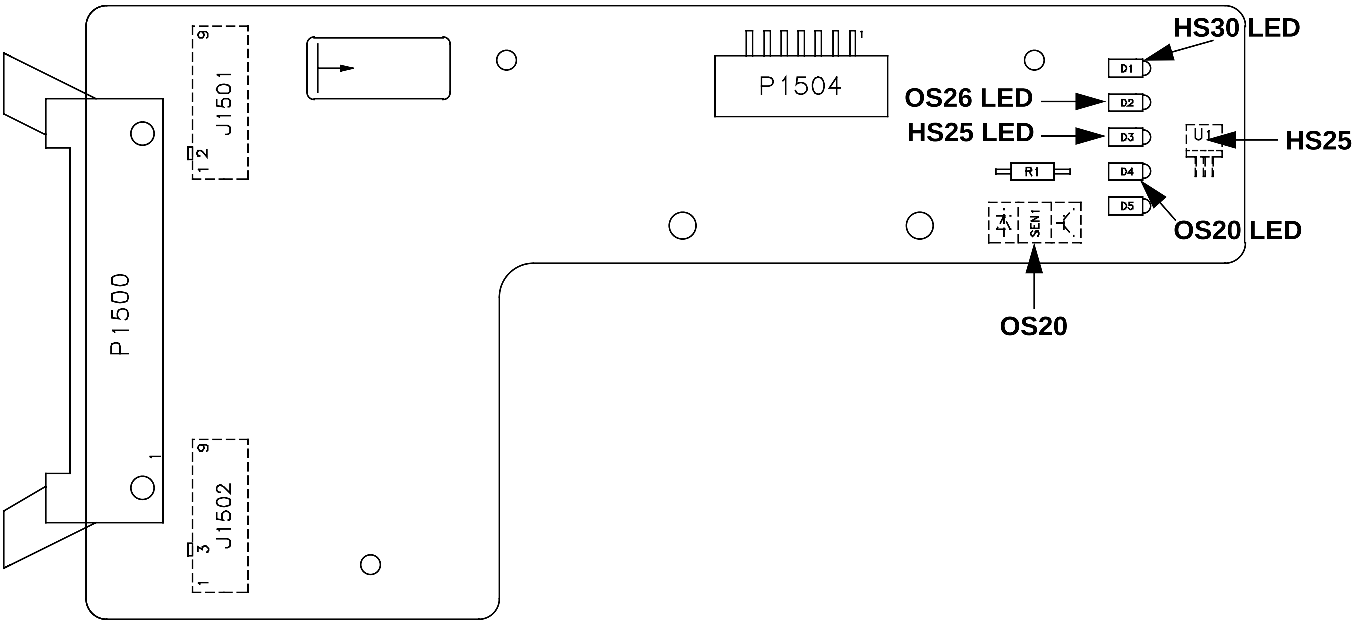
The replacement parts have different part numbers.

4.3.1 Functional Description

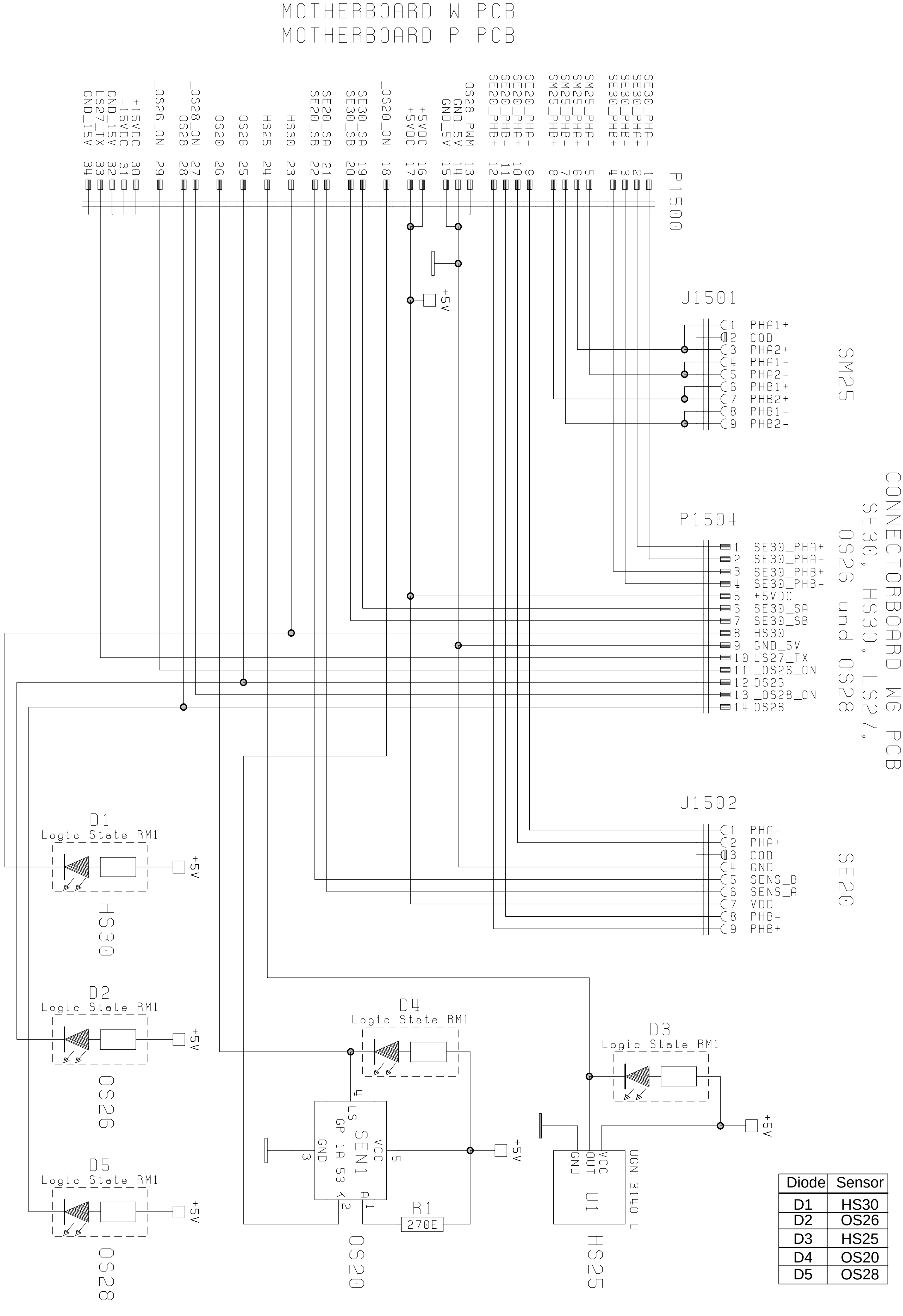
A single channel dispenser, using disposable syringes and reagent containers, dispenses the required reagents into the plates. No carry-over is possible when dispensing while using Hamilton reagent container systems with the appropriate reagent liquid and dedicated syringes.

4.3.2 Connector Boards

Connector Board W5 PCB Component Layout 146.407 revision 00

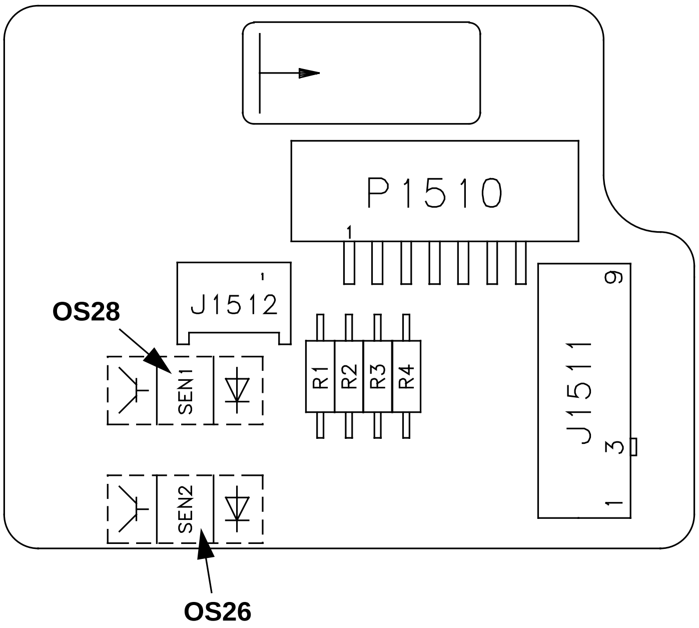

HS30 LED
OS26 LED
HS25 LED
HS25
OS20 LED
OS20
P1504
P1500
J1501
J1502
D1
D2
D3
D4
D5
R1
U1
SEN1
9
1 2
9
3
1
1

Connector Board W5 PCB Dispenser Main Connector Board 604.814 revision 01


MOTHERBOARD W PCB
MOTHERBOARD P PCB
P1500
1 SE30_PHA-
2 SE30_PHA+
3 SE30_PHB-
4 SE30_PHB+
5 SM25_PHA-
6 SM25_PHA+
7 SM25_PHB-
8 SM25_PHB+
9 SE20_PHA-
10 SE20_PHA+
11 SE20_PHB-
12 SE20_PHB+
13 OS28_PWM
14 GND_5V
15 GND_5V
16 +5VDC
17 +5VDC
18 _OS20_ON
19 SE30_SA
20 SE30_SB
21 SE20_SA
22 SE20_SB
23 HS30
24 HS25
25 OS26
26 OS20
27 _OS28_ON
28 OS28
29 _OS26_ON
30 +15VDC
31 -15VDC
32 GND_15V
33 LS27_TX
34 GND_15V
+5V
J1501
1 PHA1+
2 COD
3 PHA2+
4 PHA1-
5 PHA2-
6 PHB1+
7 PHB2+
8 PHB1-
9 PHB2-
SM25
P1504
1 SE30_PHA+
2 SE30_PHA-
3 SE30_PHB+
4 SE30_PHB-
5 +5VDC
6 SE30_SA
7 SE30_SB
8 HS30
9 GND_5V
10 LS27_TX
11 _OS26_ON
12 OS26
13 _OS28_ON
14 OS28
CONNECTORBOARD W6 PCB
SE30, HS30, LS27,
OS26 und OS28
J1502
1 PHA-
2 PHA+
3 COD
4 GND
5 SENS_B
6 SENS_A
7 VDD
8 PHB-
9 PHB+
SE20
D1
Logic State RM1
+5V
HS30
D2
Logic State RM1
+5V
OS26
D5
Logic State RM1
+5V
OS28
D4
Logic State RM1
4
LS
VCC
SEN1
GP 1A 53
GND
3
5
K 2
A 1
+5V
R1
270E
OS20
D3
Logic State RM1
+5V
VCC
OUT
GND
U1
UGN 3140 U
HS25

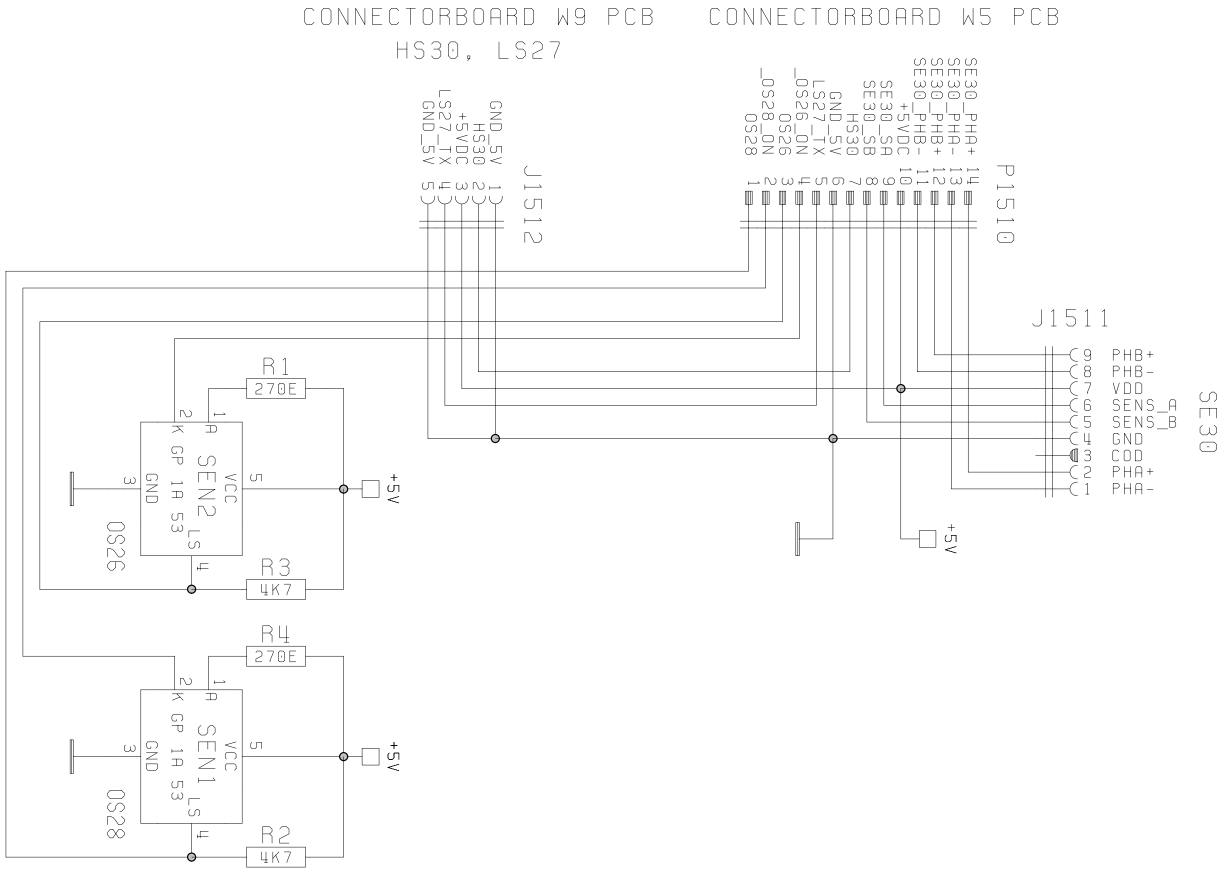
Diode	Sensor
D1	HS30
D2	OS26
D3	HS25
D4	OS20
D5	OS28

Connector Board W6 PCB Component Layout 146.409 revision 00

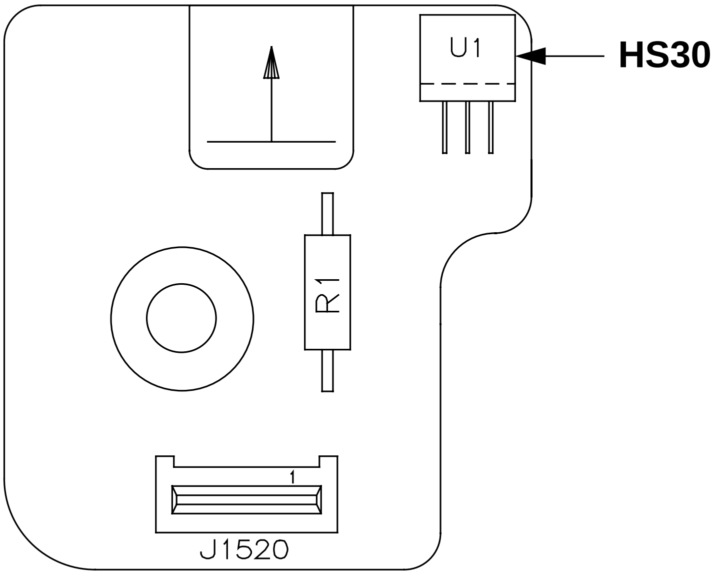

P1510
1
J1512
OS28
SEN1
SEN2
R1
R2
R3
R4
J1511
9
3
1
OS26

Connector Board W6 PCB Dosing Drive SE30 + Reagent Level Sensor LS27

604.815 revision 01

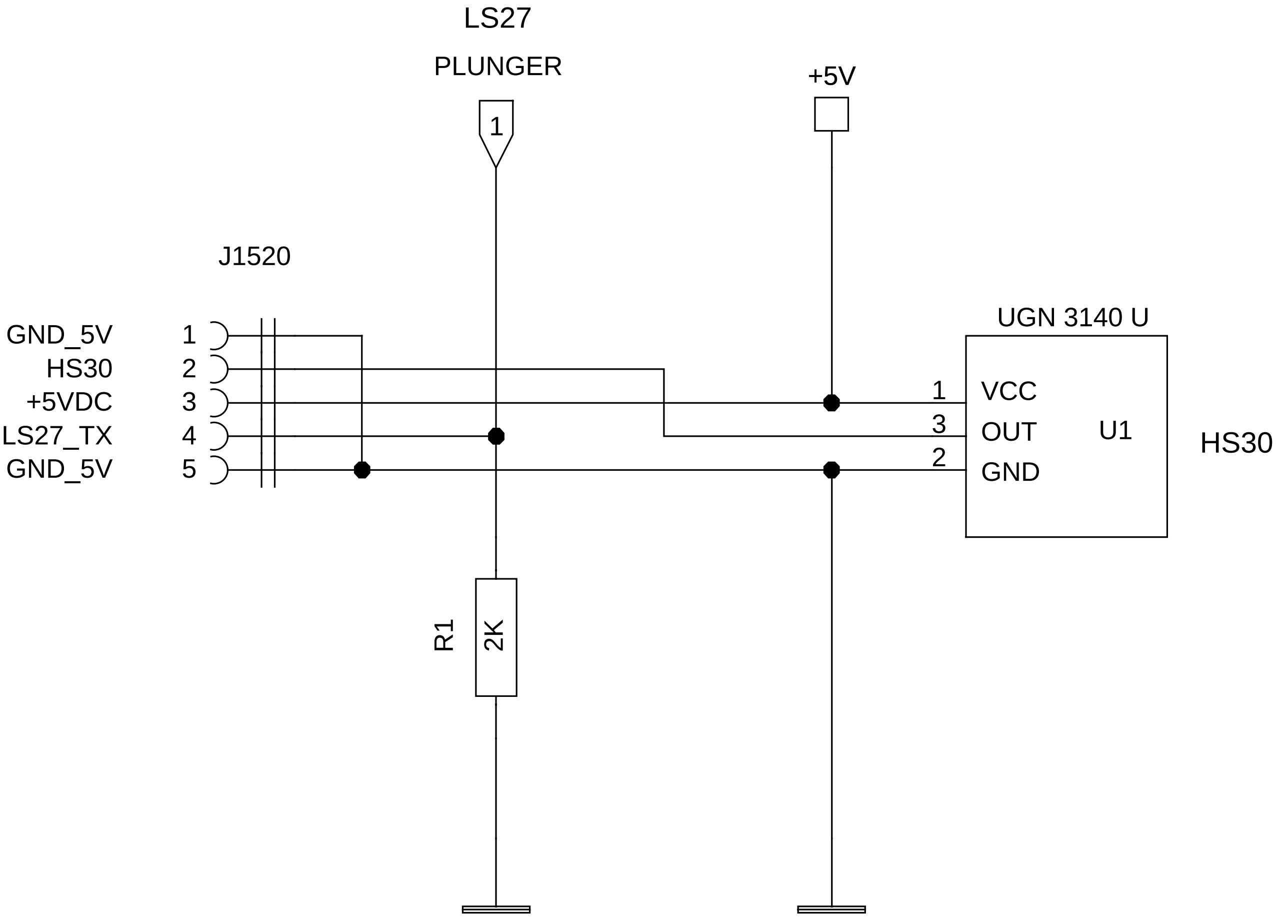

CONNECTORBOARD W9 PCB
HS30, LS27
CONNECTORBOARD W5 PCB
J1512
GND_5V 1
HS30 2
+5VDC 3
LS27_TX 4
GND_5V 5
P1510
OS28 1
_OS28_ON 2
OS26 3
_OS26_ON 4
LS27_TX 5
GND_5V 6
HS30 7
SE30_SB 8
SE30_SA 9
+5VDC 10
SE30_PHB- 11
SE30_PHB+ 12
SE30_PHA- 13
SE30_PHA+ 14
J1511
9 PHB+
8 PHB-
7 VDD
6 SENS_A
5 SENS_B
4 GND
3 COD
2 PHA+
1 PHA-
SE30
+5V
R1
270E
R3
4K7
SEN2
1 A
2 K GP 1A 53
3 GND
5 VCC
4 LS
+5V
OS26
R4
270E
R2
4K7
SEN1
1 A
2 K GP 1A 53
3 GND
5 VCC
4 LS
+5V
OS28

Connector Board W9 PCB Component Layout HS 30, LS27 146.256 revision 01


U1
HS30
R1
1
J1520

Connector Board W9 PCB Dosing Init. Sensor HS30 + Level Sensor LS27

604.826 revision 00


LS27
PLUNGER
1
+5V
J1520
GND_5V
HS30
+5VDC
LS27_TX
GND_5V
1
2
3
4
5
UGN 3140 U
1
3
2
VCC
OUT
GND
U1
HS30
R1
2K

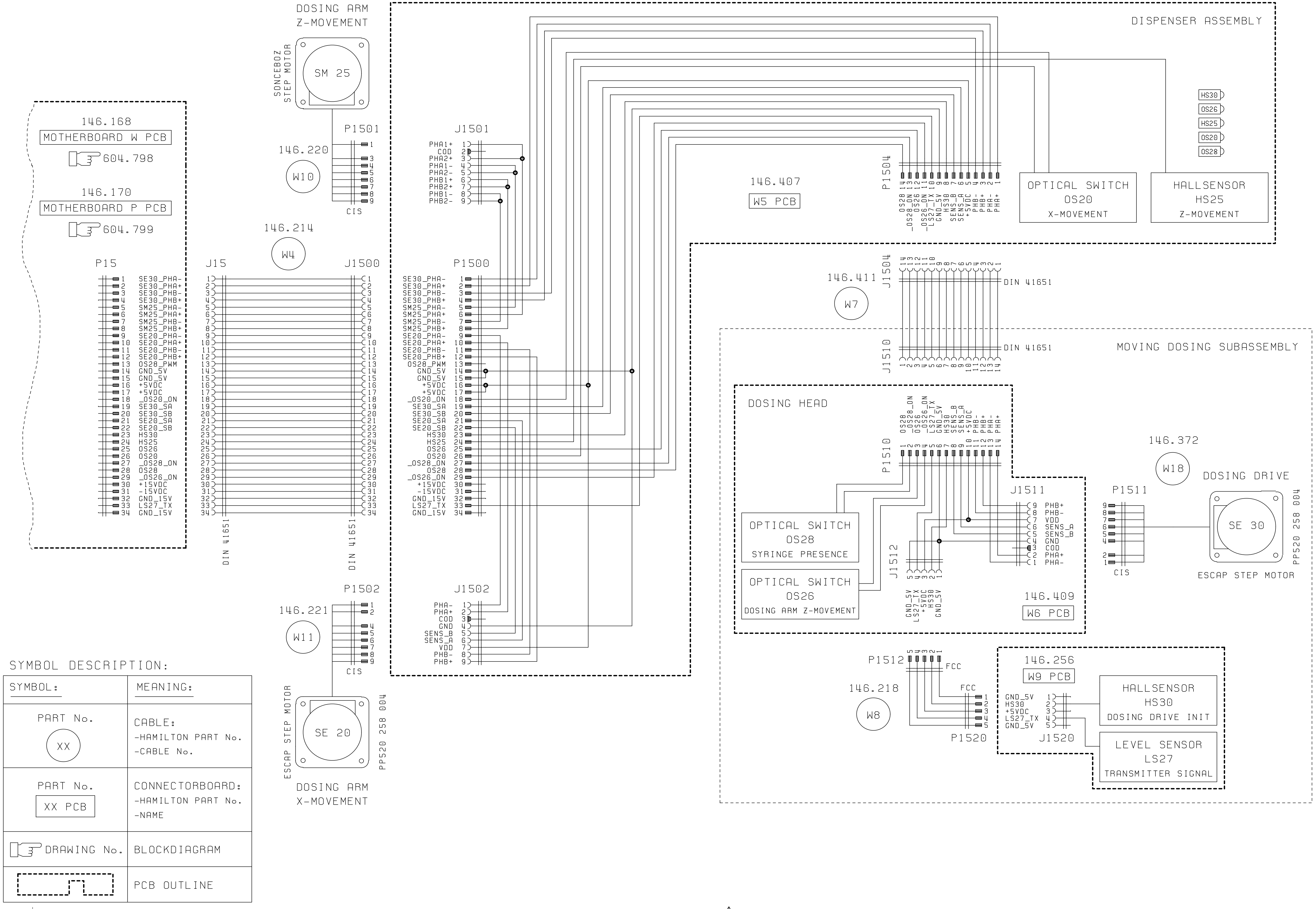
4.3.3 Wiring Diagram

Refer to the following drawing:

- ❐ Dispenser: Dwg No. 604 490

Wiring Diagram Dispenser

604.490 revision 02


DOSING ARM Z-MOVEMENT
SONCEBOZ STEP MOTOR
SM 25
P1501
146.220
W10
CIS
DISPENSER ASSEMBLY
146.168
MOTHERBOARD W PCB
604.798
146.170
MOTHERBOARD P PCB
604.799
146.214
W4
P15
J15
J1500
P1500
J1501
DIN 41651
SE30_PHA-
SE30_PHA+
SE30_PHB-
SE30_PHB+
SM25_PHA-
SM25_PHA+
SM25_PHB-
SM25_PHB+
SE20_PHA-
SE20_PHA+
SE20_PHB-
SE20_PHB+
OS28_PWM
GND_5V
GND_5V
+5VDC
+5VDC
_OS20_ON
SE30_SA
SE30_SB
SE20_SA
SE20_SB
HS30
HS25
OS26
OS20
_OS28_ON
OS28
_OS26_ON
+15VDC
-15VDC
GND_15V
LS27_TX
GND_15V
PHA1+
COD
PHA2+
PHA1-
PHA2-
PHB1+
PHB2+
PHB1-
PHB2-
146.407
W5 PCB
P1504
OS28
_OS28_ON
OS26
_OS26_ON
LS27_TX
GND_5V
HS30
SENS_B
SENS_A
+5VDC
PHB-
PHB+
PHA-
PHA+
HS30
OS26
HS25
OS20
OS28
OPTICAL SWITCH
OS20
X-MOVEMENT
HALLSENSOR
HS25
Z-MOVEMENT
146.411
W7
J1504
J1510
DIN 41651
MOVING DOSING SUBASSEMBLY
DOSING HEAD
P1510
OPTICAL SWITCH
OS28
SYRINGE PRESENCE
OPTICAL SWITCH
OS26
DOSING ARM Z-MOVEMENT
J1512
GND_5V
LS27_TX
+5VDC
HS30
GND_5V
J1511
PHB+
PHB-
VDD
SENS_A
SENS_B
GND
COD
PHA+
PHA-
146.409
W6 PCB
146.372
W18
P1511
CIS
DOSING DRIVE
SE 30
PP520 258 004
ESCAP STEP MOTOR
P1502
146.221
W11
CIS
J1502
PHA-
PHA+
COD
GND
SENS_B
SENS_A
VDD
PHB-
PHB+
ESCAP STEP MOTOR
SE 20
PP520 258 004
DOSING ARM X-MOVEMENT
P1512
FCC
146.218
W8
FCC
P1520
146.256
W9 PCB
GND_5V
HS30
+5VDC
LS27_TX
GND_5V
J1520
HALLSENSOR
HS30
DOSING DRIVE INIT
LEVEL SENSOR
LS27
TRANSMITTER SIGNAL

SYMBOL DESCRIPTION:

SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
DRAWING No.	BLOCKDIAGRAM
	PCB OUTLINE

4.3.4 Replacing spare parts

NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

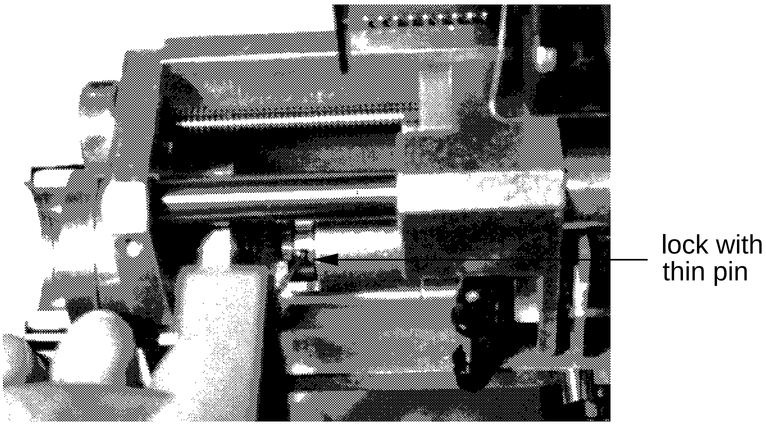
4.3.4.1 Connector board W9 PCB (item 25) and cable W8 (item 110)

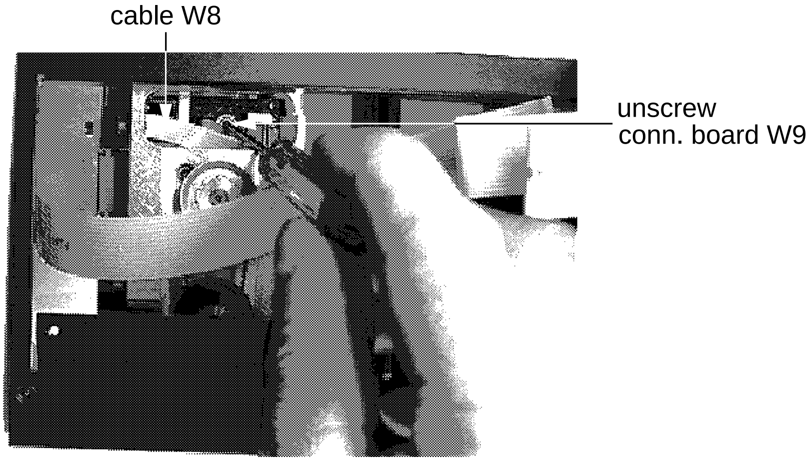
Remove the dispenser from the W/D module (see section 4.1.4.1).

Remove *cover plate item 106* (3 screws).

Prevent the *plunger ram (item 115*) from turning by locking it using a thin pin (see following picture).

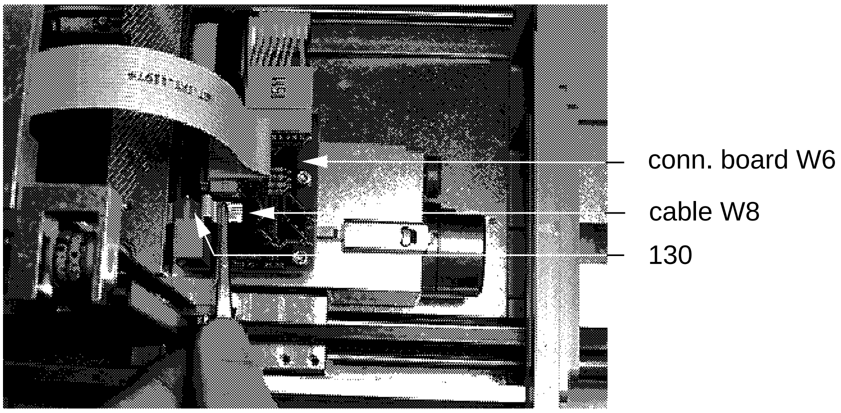
Unscrew connector board W9**.** Note: Isolating ring (item 10) falls off when connector board W9 is removed.





To disconnect cable W8 from conn. board W6, remove the *guard (item 107*) and the *motor shield (item 114*).

Unscrew conn. board W6 and slacken cable clamp (screw item 130).

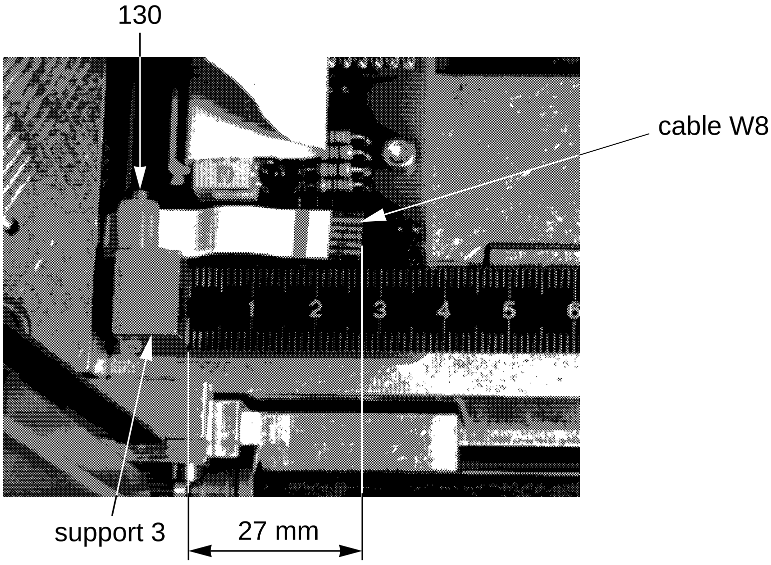

conn. board W6
cable W8
130

Unplug and replace cable W8.

Remounting:

Remount in reverse order.

When connecting *cable W8 (item 110*) to conn. board W6, pull the cable 27 mm past support 3, tighten screw (item 130) and then connect cable to connector board (use tweezers).


130
cable W8
support 3
27 mm

Place the isolating ring (item 10) back under conn. board W9 (ring falls off when conn. board W9 is removed).

Lock screw fixing conn. board W9 with Loctite 222.

Make sure the locating pin on connector board W9 inserts into the locating hole provided.

Bring the plunger drive to the uppermost position by turning the knurled nut (item 28) and ensure cable W8 does not touch *upper gripper head (item 34)*. If touching, slightly bend cable.

NOTE
Correctly position cable W7 (refer to section 4.3.4.12).

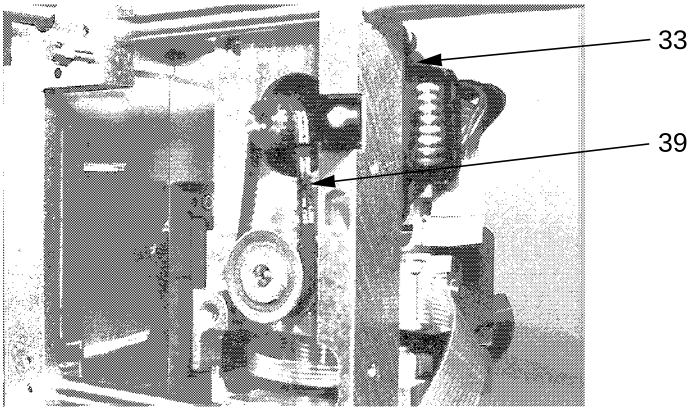
4.3.4.2 Step motor W SE30 (item 33) and Gear belt MXL (item 39)

Remove the dispenser from the W/D module (see section 4.1.4.1).

Unscrew and remove *cover plate item 106* (3 screws), *guard item 107* (4 screws) and *motor shield item 114* (3 screws).

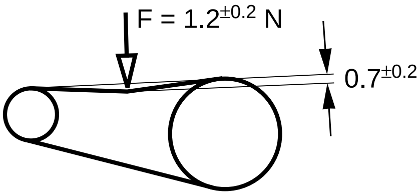
To replace the *gear belt (item 39*) turn the pulley and slip the belt off the motor pulley.

To replace the *step motor (item 33*) disconnect the motor from connector board W6, unscrew motor (2 screws) and replace.

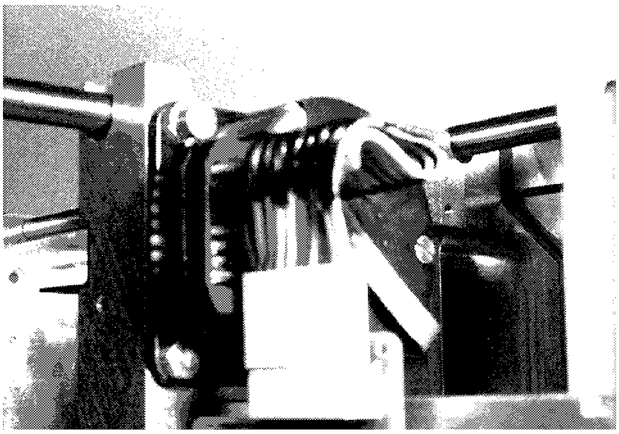


Remounting:

Belt tension:



Bend the new motor cable in the same way as the old motor cable:



4.3.4.3 Regulating screw 2 compl. (items 41 & 42) p/n 148 231

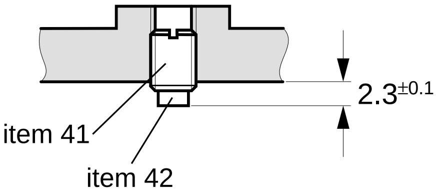
Regulating screw 2 compl. is in the ML F.A.M.E. spare case.

Remove the dispenser from the W/D module (see section 4.1.4.1).

Unscrew and remove *cover plate item 106* (3 screws).

Replace regulating screw 2, locking it with Loctite 222.

Adjust as follows:



4.3.4.4 Guide bush item 50 (on guide shaft 3 item 79)

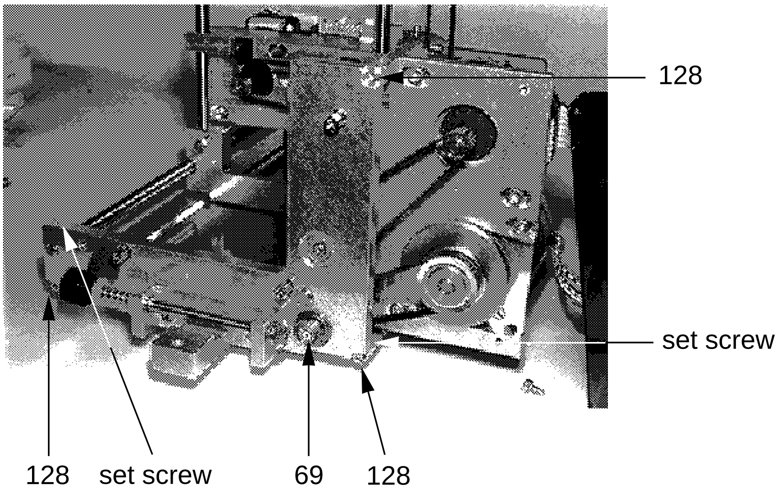
Remove dispenser from the W/D module (see section 4.1.4.1).

Remove connector board W5 (see section 4.3.4.11).

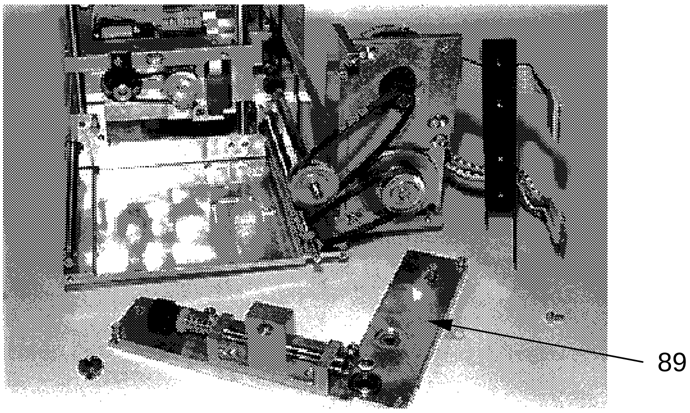
Loosen belt tensioning screw item 119 (see section 4.3.4.6).
Slacken the two motor fixing screws.

Remove *miter gear item 69* (2 screws item 135).

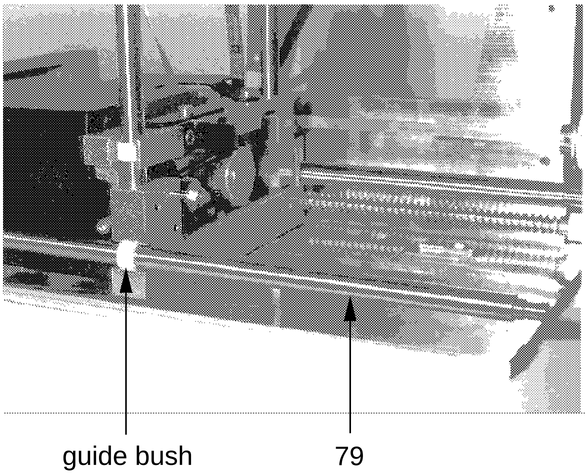
Slacken the two set screws (item 119) fixing guide shafts 2 and 3 (items 78 and 79).



Remove the *upper base item 89* (three screws item 128).



Slide out the *guide shaft 3 (item 79*) and replace the guide bush.



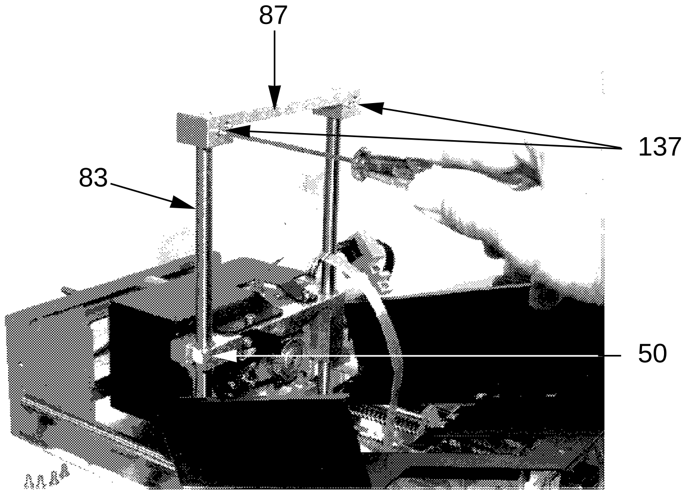
4.3.4.5 Guide bush item 50 (on guide shaft 5 item 83)

Remove the dispenser from the W/D module (see section 4.1.4.1).

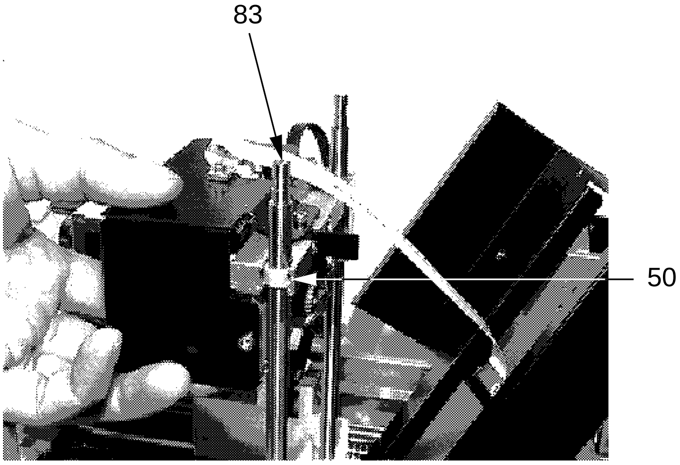
Remove *cover plate item 106* (3 screws) and *guard item 107* (4 screws).

Remove *pulley support item 86* (2 screws).

Slacken the two set screws item 137 and remove the *cross bar item 87*.



Move the z-movement unit to the appropriate position, slide the dispensing head off the shafts and replace the guide bush.



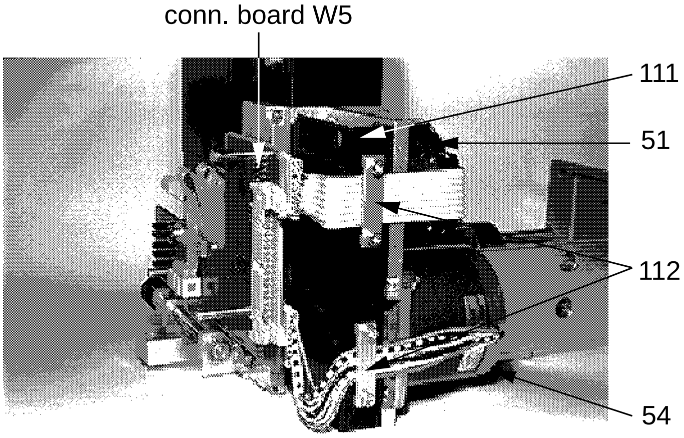
4.3.4.6 Step motor W SM25 (item 51) and step motor W SE20 (item 54)

Remove the dispenser from the W/D module (see section 4.1.4.1).

Disconnect both step motors on connector board W5.

Remove both *cable clamps (item 112*).

Remove *belt guard (item 111*).



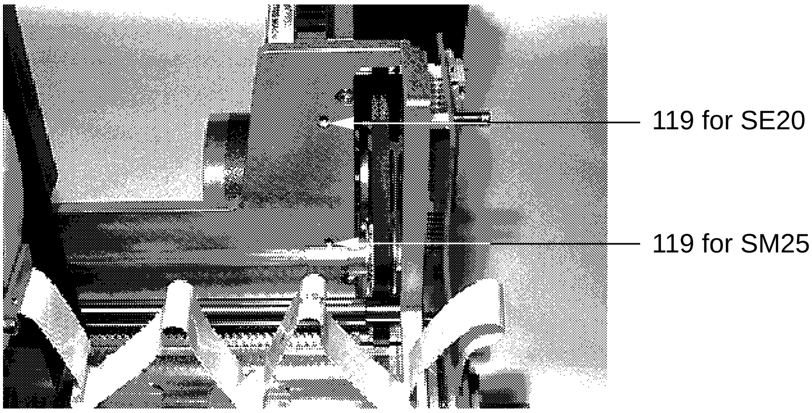
Unscrew motor (2 screws) and replace.

Remounting:

Loosen belt tensioning screw (item 119).

Install new motor, tighten screws only slightly.

Tighten belt tensioning screw (item 119) until proper belt tension is obtained (see section 4.3.4.7), then tighten motor fixing screws.



4.3.4.7 Gear belt MXL (item 55) and Gear belt (item 56)

Remove the dispenser from the W/D module (see section 4.1.4.1).

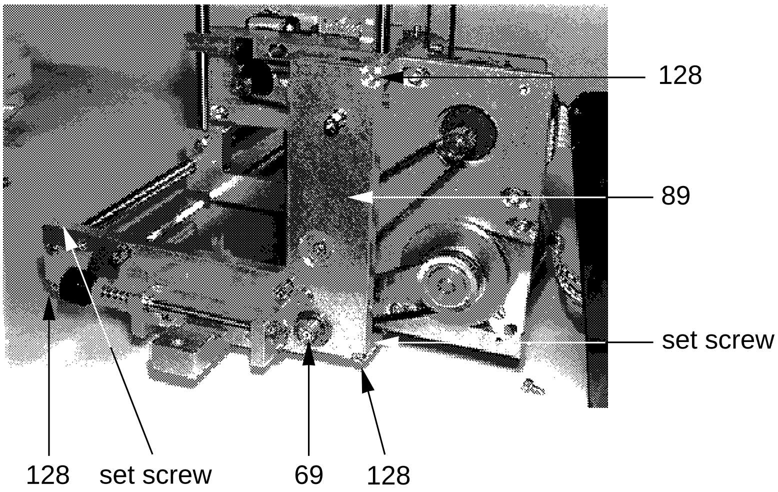
Remove connector board W5 (see section 4.3.4.11).

Unscrew and remove *belt guard (item 111*).

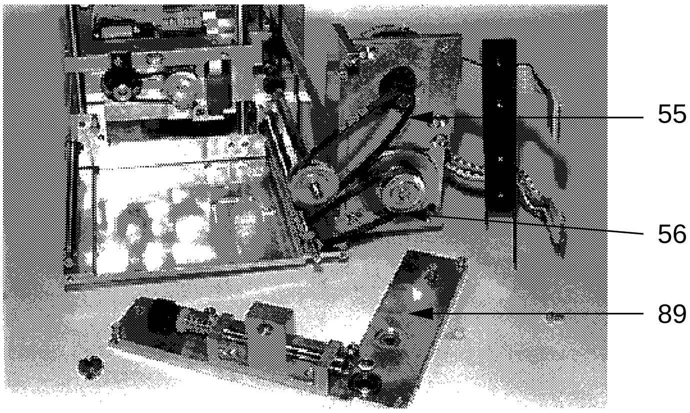
Loosen belt tensioning screw item 119 (see section 4.3.4.6).
Slacken the two motor fixing screws.

Unscrew and remove *miter gear item 69* (2 screws item 135).

Slacken the two set screws (item 119) fixing guide shafts 2 and 3 (items 78 and 79).



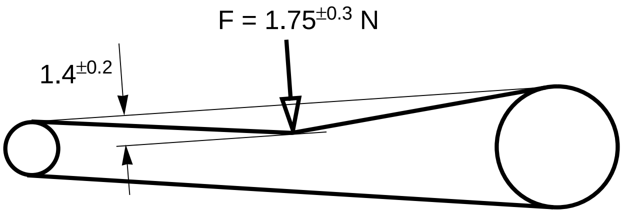
Unscrew and remove the *upper base item 89* (three screws item 128), and replace belts.



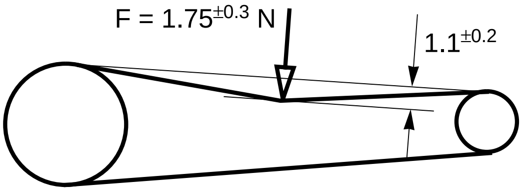
Remounting:

When remounting *miter gear (item 69)*, press the *lead screw (item 65)* up (press on screw 2 item 64) and the miter gear down and tighten the two miter gear fixing screws (item 135) thus eliminating miter gear play.

Gear belt (item 55) tension:



Gear belt (item 56) tension:



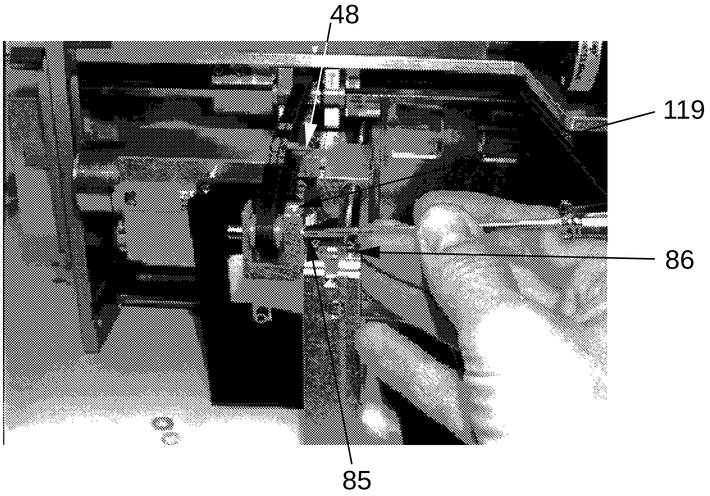
4.3.4.8 Gear belt (item 57)

Remove the dispenser from the W/D module (see section 4.1.4.1).

Remove *cover plate item 106* (3 screws) and *guard item 107* (4 screws).

Loosen *pulley support item 86* (2 screws) and slacken belt.

Slacken the *set screw (item 119*) and push out *shaft (item 85*).



Unscrew and remove *cable clamp (item 48).*

Remove connector board W5 (see section 4.3.4.11).

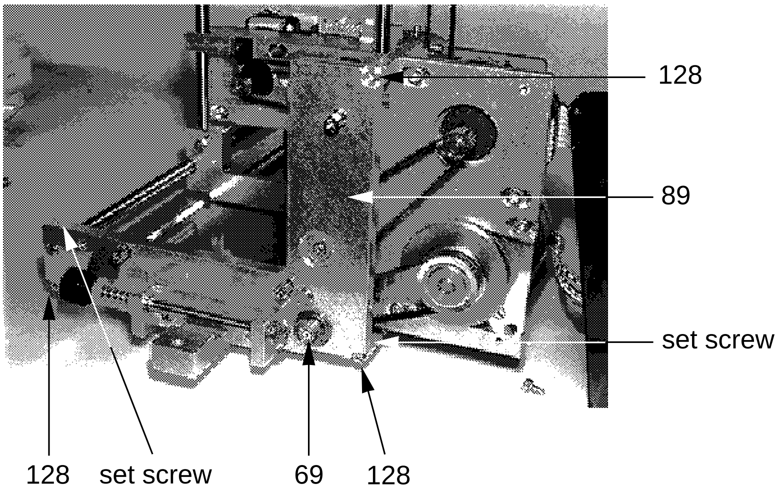
Remove *belt guard (item 111).*

Loosen belt tensioning screw item 119 (see section 4.3.4.6).
Slacken the two motor fixing screws.

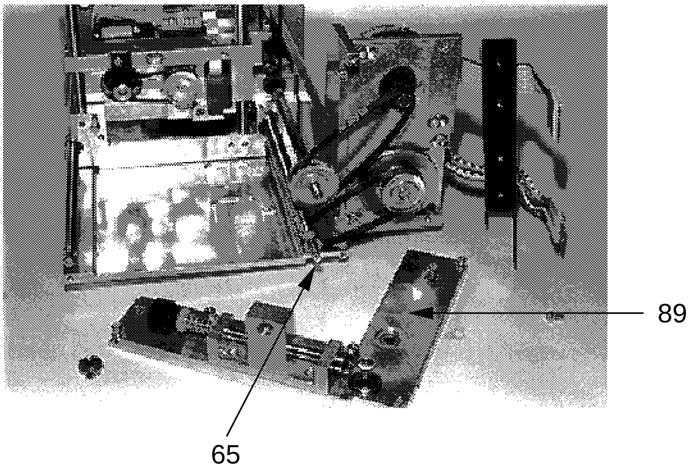
Remove *guard plate item 96* (2 screws).

Remove *miter gear item 69* (2 screws Item 135).

Slacken the two setscrews (item 119) fixing guide shafts 2 and 3 (items 78 and 79).

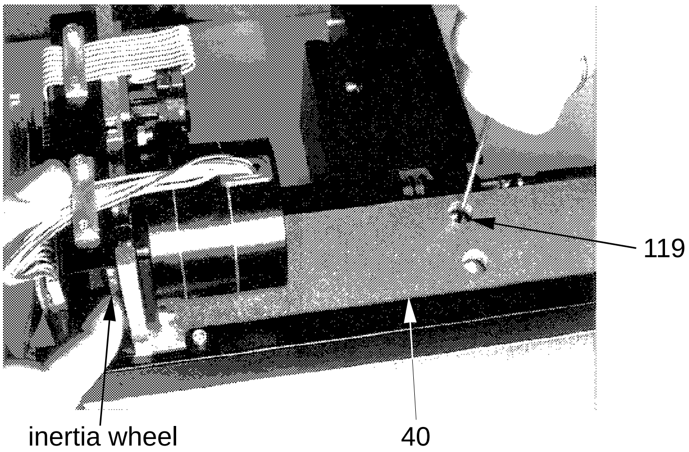


Remove the *upper base item 89* (three screws item 128).

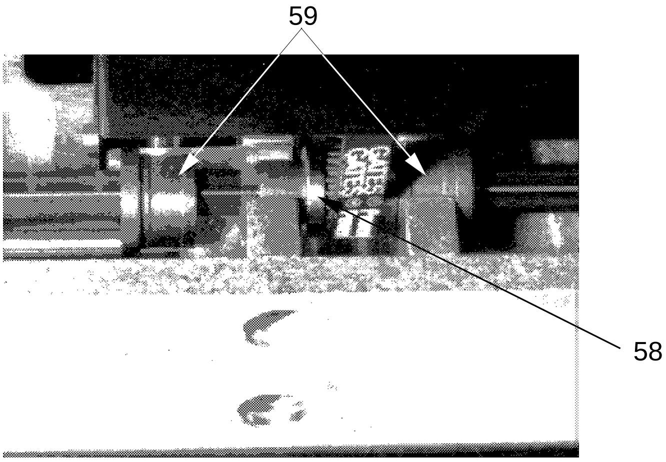


Pull out the *square shaft (item 66)*.

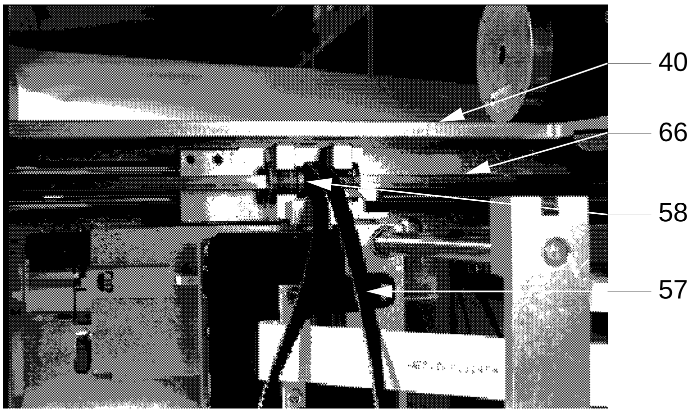
Align one of the *setscrews (item 119*) with the hole in *the side plate (item 40*) by turning inertia wheel or by using height mover tool. Loosen the two set screws (item 119).



The two *bushes (item 59)* can now be taken off to the left and right.

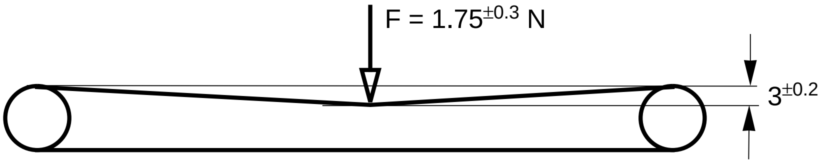


Remove the *gear belt (item 57)* with the *pulley 3 (item 58)* and replace.



NOTE
When remounting, tighten the two setscrews (item 119) to a torque of 40 Ncm (3.54 in.lbs).

Belt tension:



4.3.4.9 Connector board W6 PCB item 101

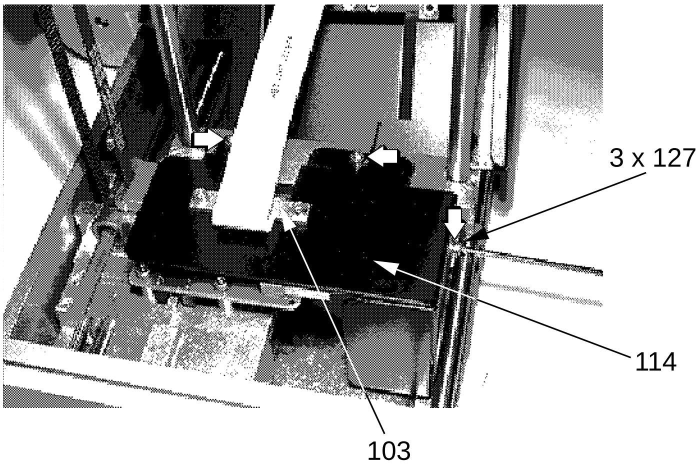
ATTENTION
If connector board W6 has part number 146 205 a dispenser upgrade must be carried out (see section 4.3).

Remove the dispenser from the W/D module (see section 4.1.4.1).

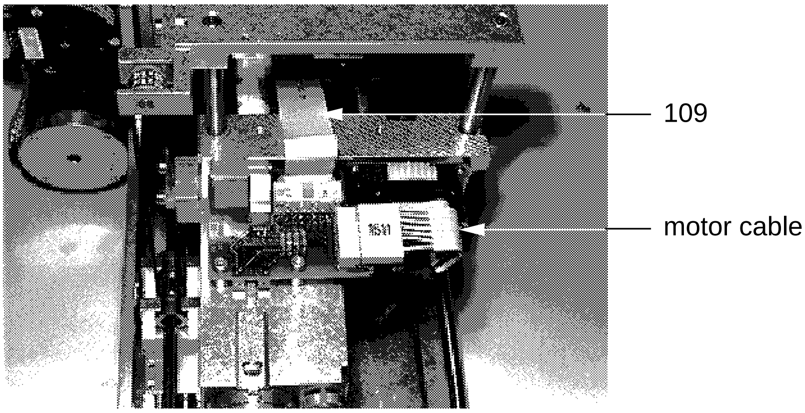
Manually drive the dispenser head down (near to the bottom).

Remove *cover plate item 106* (3 screws) and *guard item 107* (4 screws).

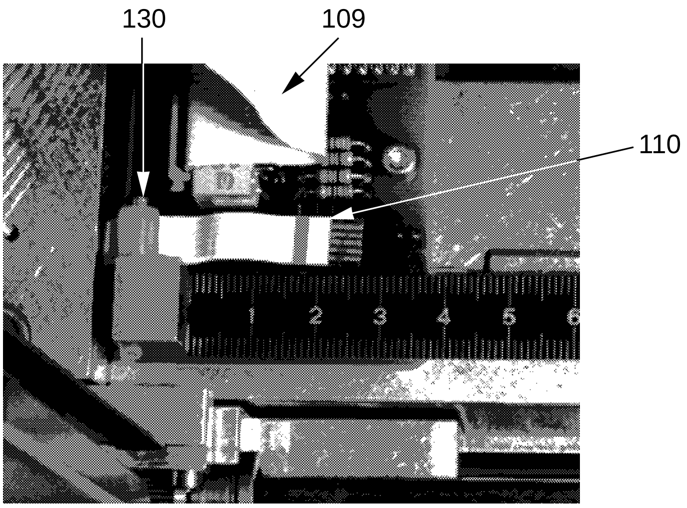
Remove *cable clamp (item 105)*, *cable clamp (item 103) and motor shield item 114* (3 screws item 127).



Disconnect *cable W7 (item 109)* and the motor cable from connector board W6.



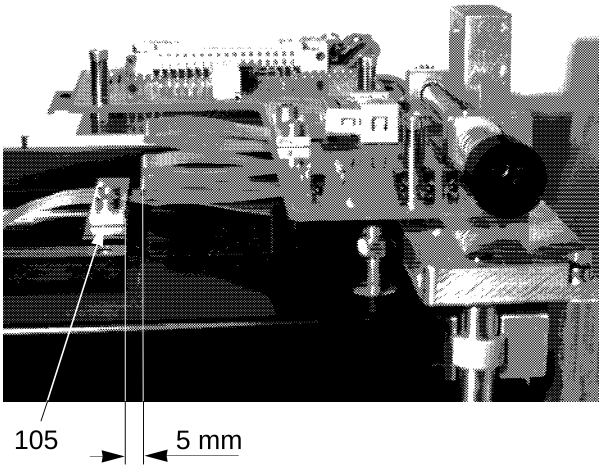
Slacken cable clamp (screw item 130) and disconnect *cable W8 (item 110)* from connector board W6.



Replace connector board W6.

Remounting:

Drive dispenser head to the uppermost position and adjust cable in *cable clamp 2 (item 105)* as shown in the following picture:

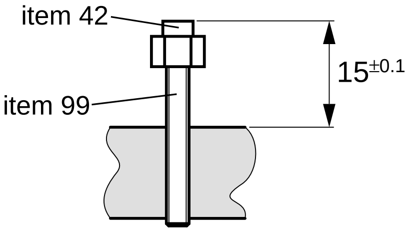


ATTENTION
Calibrate the instrument (see section 1.1.4.3.17).

4.3.4.10 Regulating screw 1 compl. (items 42 & 99) p/n 148 230

Regulating screw 1 compl. is in the ML F.A.M.E. spare case.

Adjust the height of the regulating screw as shown in the drawing below.
Lock the regulating screw with Loctite 222.



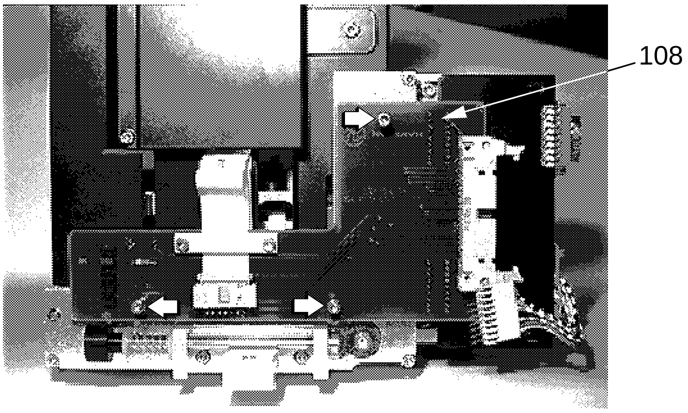
4.3.4.11 Connector board W5 PCB (item 108)

ATTENTION
If connector board W5 has part number 146 203 a dispenser upgrade must be carried out (see section 4.3).

Remove the dispenser from the W/D module (see section 4.1.4.1).

Disconnect the 3 cables from connector board W5.

Replace the connector board (3 screws).



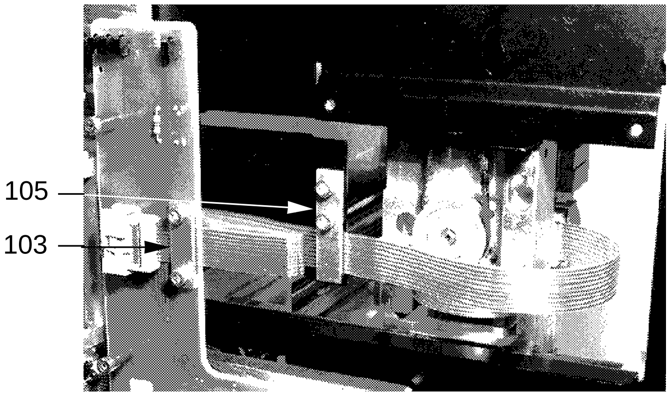
4.3.4.12 Cable W7 (item 109)

ATTENTION
If cable W7 has part number 146 217 a dispenser upgrade must be carried out (see section 4.3).

Remove the dispenser from the W/D module (see section 4.1.4.1).

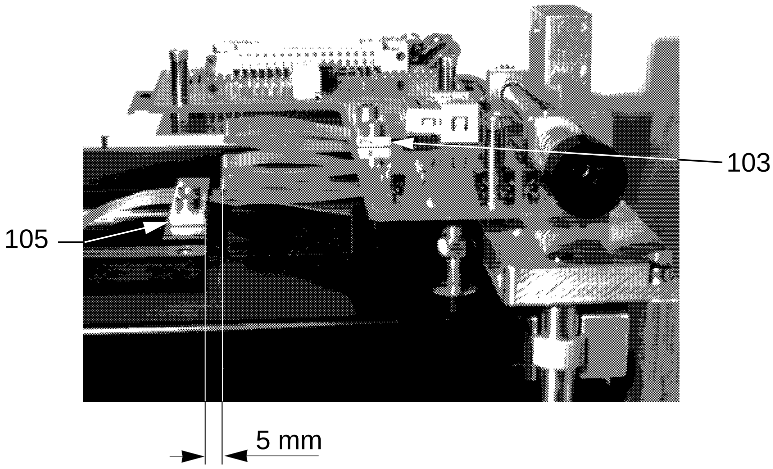
Unscrew and remove *cover plate item 106* (3 screws) and *motor shield item 114* (3 screws).

Loosen *cable clamp (item 105*), remove *cable clamp (item 103*), disconnect and replace cable W7.



Remounting:

Secure cable W7 with *cable clamp (item 103)*. Drive dispenser head to the uppermost position and adjust cable in *cable clamp 2 (item 105)* as shown in the following picture:



4.3.5 Spare Parts List

DISPENSER 147 377 Revision: 02

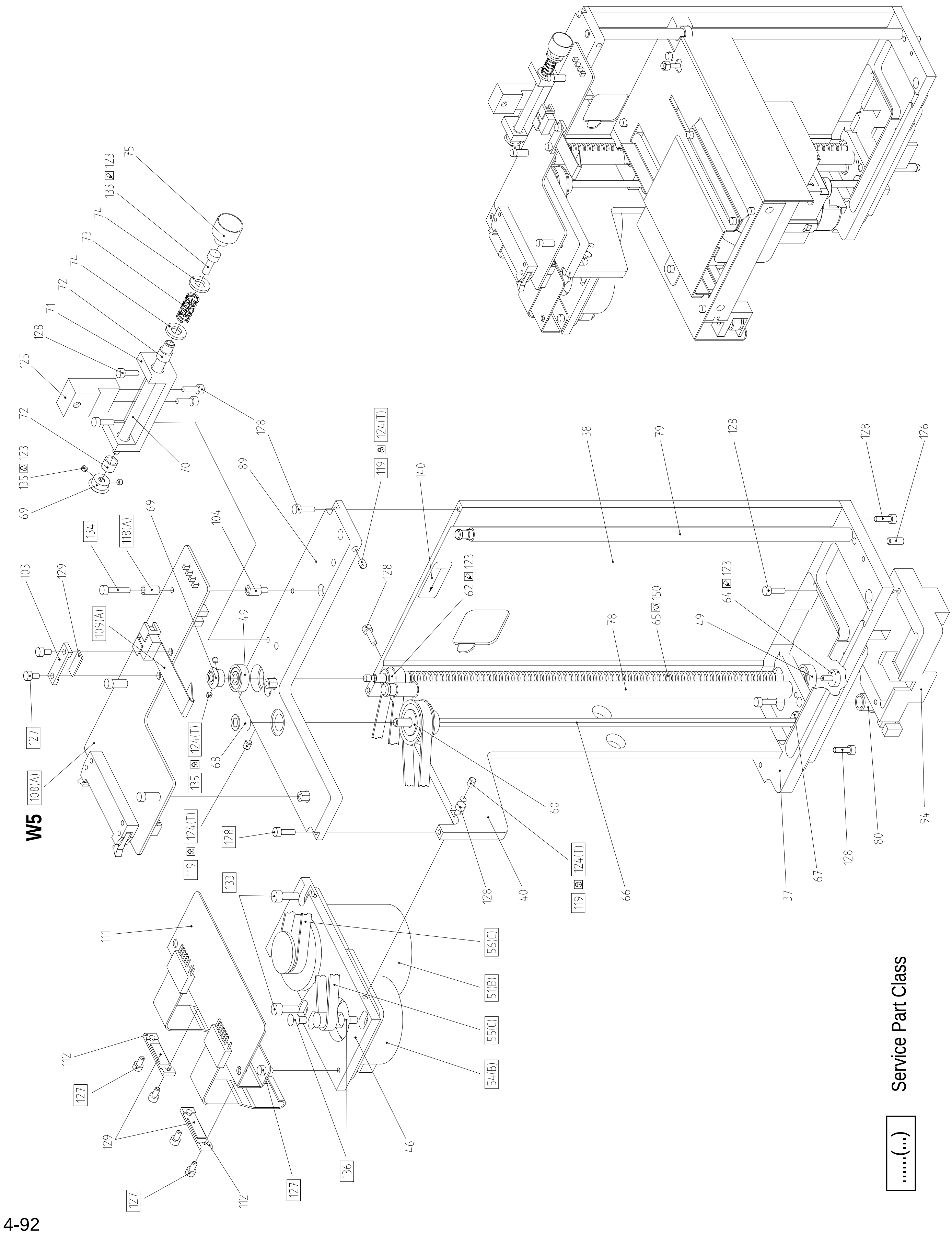
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147440	TIPGREIFER 1	00	1	1.000	
147441	TIPGREIFER 2	00	2	1.000	
147442	TIPFIXIERUNG	00	3	1.000	
147444	PLUNGERFIXIERUNG 1	00	4	1.000	
147445	PLUNGERFIXIERUNG 2	00	5	1.000	
148232	RING	00	7	2.000	
147399	PLUNGERFHRUNG	00	8	1.000	
147417	ISOLIERSCHEIBE	00	10	1.000	A
147381	LASCHE	00	13	2.000	
147380	ROLLE	00	14	4.000	
148180	ACHSE	00	15	2.000	
251913	ZYL-STIFT 2,5X8 VSM12771B	00	19	2.000	
147443	GLEITLAGER BEARBEITET	00	20	2.000	
147412	SUPPORT 1	00	21	1.000	
279126	ZYL-STIFT 2.0X12 VSM12771B	00	22	3.000	
137416	SCHLAUCHHUELLE	00	23	2.000	B
137415	KLEMMHUELSE	00	24	2.000	B
146256	CONNECTORBOARD W9 PCB	01	25	1.000	A
147415	DRUCKFEDER PLUNGER	00	26	1.000	
147416	DRUCKFEDER TIP	00	27	1.000	
147392	VORSPANNSCHRAUBE 1	01	28	1.000	
250027	K.LAGER ID= 4 AD=13 B=5	00	29	1.000	
147403	DOSIERSPINDEL	01	31	1.000	
147406	SPINDELMUTTER 1	00	32	1.000	
146372	STEP MOTOR W SE30	00	33	1.000	B
147400	GREIFKOPF-OBERTEIL	00	34	1.000	
147401	GREIFKOPF-UNTERTEIL	00	35	1.000	
147405	ZAHNRIEMENRAD 1	00	36	1.000	
148185	CHASSISBODEN	00	37	1.000	
148186	RCKWAND	01	38	1.000	
258056	ZAHNRIEMEN MXL Z= 63 X 3/16”	00	39	1.000	C
148188	SEITENWAND	01	40	1.000	
147409	STELLSCHRAUBE 2	00	41	1.000	
279369	SCHEIBENMAGNET D=4 H=3MM	01	42	2.000	B
279365	SINTERBZ.LAGER 8E7/11R7/ 8 MM	00	43	2.000	
279250	ZYL-STIFT 3.0X10 VSM12771B	00	44	2.000	
147391	FHRUNGSWELLE 1	00	45	1.000	
148187	MOTORPLATTE	00	46	1.000	
147390	MITNEHMER	00	47	1.000	
147389	RIEMENKLEMME	00	48	1.000	
250028	K.LAGER ID= 5 AD=16 B=5	00	49	3.000	
148189	FHRUNGSBCHSE	00	50	2.000	B
146220	STEP MOTOR W SM25	00	51	1.000	B
146221	STEP MOTOR W SE20	00	54	1.000	B
258051	ZAHNRIEMEN MXL Z= 94 X 1/4	00	55	1.000	C

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
258069	ZAHNRIEMEN Z= 85x 1/4”	00	56	1.000	C
258058	ZAHNRIEMEN Z= 160 X 1/4”	00	57	1.000	C
147420	ZAHNRIEMENRAD 3	00	58	1.000	
147421	LAGERBCHSE	00	59	2.000	
147422	ZAHNRIEMENRAD 4	00	60	1.000	
147423	RITZEL 2	00	62	1.000	
147387	SPINDELMUTTER 2	00	63	1.000	
147424	VORSPANNSCHRAUBE 2	00	64	1.000	
148349	Z-SPINDEL	00	65	1.000	
147426	4KT-WELLE	00	66	1.000	
253012	SINTERBZ.LAGER 5E7/ 9r7/13/5MM	00	67	1.000	
253010	SINTERBZ.LAGER 5E7/10r7/ 8MM	00	68	1.000	
148181	KEGELRAD	00	69	2.000	
147386	WELLE	00	70	1.000	
147427	SUPPORT 2	00	71	1.000	
253009	GLEITLAGER ZYL. 6/8 X 6	00	72	2.000	
256119	DRUCKFEDER D=0.63 DM=7.27LO=20	00	73	1.000	
409403	U-SCHEIBE M6 DIN125A	00	74	2.000	
147428	ZENTRIERBCHSE	00	75	1.000	
148338	GLEITLAGER BEARB.	00	76	2.000	
147384	VERRIEGELUNGSSTANGE	00	77	1.000	
147385	FHRUNGSWELLE 2	00	78	1.000	
147429	FHRUNGSWELLE 3	00	79	1.000	
147383	STTZROHR	00	80	1.000	
147388	Z-FHRUNG	01	81	1.000	
147394	FHRUNGSWELLE 4	00	82	1.000	
147395	FHRUNGSWELLE 5	00	83	1.000	
147430	UMLENKROLLE	00	84	1.000	
251947	ZYL-STIFT 5X20 VSM12771B	00	85	1.000	
147393	ROLLENHALTER	00	86	1.000	
147396	TRGER	00	87	1.000	
147439	CHASSIS OBERTEIL	01	89	1.000	
148366	SENSORFAHNE	00	90	1.000	
7281117	KLEBBAND PTFA BE. D=0.23 B=9	00	91	0.100	
148377	DISTANZHUELSE	00	92	2.000	
148378	RAHMEN	00	94	1.000	
147410	SCHALTFAHNE 2	00	98	1.000	
137319	STELLSCHRAUBE 1	00	99	1.000	
146409	CONNECTORBOARD W6 PCB	00	101	1.000	A
147411	SUPPORT 3	01	102	1.000	
147434	KABELKLEMME 1	01	103	2.000	
257038	DIST.HALTER M3X8 I/A	00	104	3.000	
147435	KABELKLEMME 2	01	105	1.000	
147437	ABDECKBLECH	00	106	1.000	
147397	STTZBLECH	01	107	1.000	
146407	CONNECTORBOARD W5 PCB	00	108	1.000	A
146411	CABLE W7	00	109	1.000	A
146218	CABLE W8	00	110	1.000	A
147438	FHRUNGSBLECH	00	111	1.000	
147436	KABELKLEMME 3	00	112	2.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147804	ANSCHLAG	00	113	1.000	
148190	MOTORBLECH	01	114	1.000	
147407	PLUNGERSTEMPEL	00	115	1.000	
147414	ISOLIERHLSE	00	116	1.000	
420527	SCHAFTSCHRAUBE M3X10 DIN427	00	117	1.000	
257037	DISTANZHALTER ID=3.1 AD=5 L=10	00	118	3.000	A
405462	GEW.STIFT M4 X 5 VERZ DIN916	00	119	11.000	
511010	LOCTITE 638 50mL	00	123	0.000	T
511006	LOCTITE 222 50mL	00	124	0.000	T
147880	SUPPORT EL. RACK	00	125	1.000	
251932	ZYL.STIFT 4 X10 VSM12771B	00	126	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	127	23.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	128	29.000	
7279355	KLEBBAND 1-SEITIG D= 2 B= 6	00	129	0.200	
400226	ZYL-SCHR.M 2X12 DIN912 A2	00	130	2.000	
409264	U-SCHEIBE M 2 DIN125A	00	131	2.000	
420003	ZYL-SCHR.M 2X 6 DIN912 A2	00	132	4.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	133	3.000	
400007	ZYL-SCHRAUBE M 3 X16 DIN912	00	134	3.000	
405201	GEW.STIFT M 3X 4 VERZ DIN914	00	135	4.000	
400023	ZYL-SCHRAUBE M 4 X 6 DIN912	00	136	4.000	
405223	GEW.STIFT M4x6 DIN914	00	137	4.000	
400268	ZYL-SCHR.M 3X18 DIN912 A2	00	138	2.000	
405425	GEW.STIFT M2X6 ROSTFR.A2	00	139	1.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	140	1.000	
511057	OEL MICROGLISS D-5 20ML	00	141	0.000	T
511060	MICROGLISS D-5	00	142	0.000	
511061	FIXODROP FK/K-10	00	143	0.000	
511021	ARALDIT HARZ AW 106	00	144	0.000	
511022	ARALDIT HAERTER HV 953 U	00	145	0.000	
511058	MOLYKOTE FETTPASTE DX	00	150	0.000	

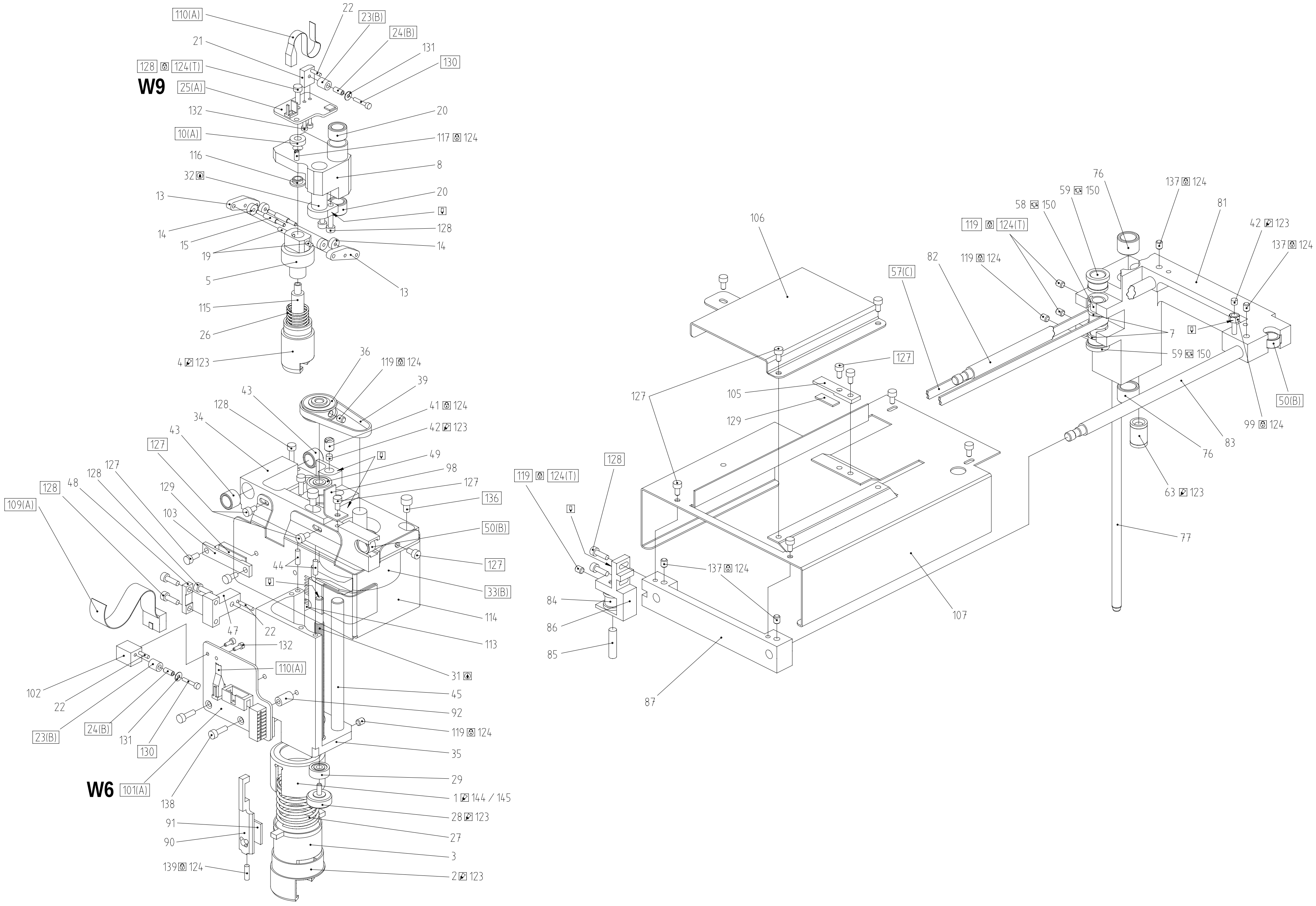
4.3.6 3D Drawings

Dispenser: Dwg. 147 377/1 revision 07


W5
108(A)
127
103
129
109(A)
134
118(A)
69
135 123
72
125
128
71
72
74
73
74
133 123
75
70
119 124(T)
135 124(T)
68
49
104
89
128
133
128
127
111
112
129
127
112
136
46
54(B)
55(C)
51(B)
56(C)
128
119 124(T)
140
62 123
128
40
119 124(T)
60
66
78
65 150
38
79
49
64 123
128
37
67
128
80
94
128
126

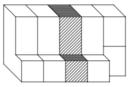
......(...) Service Part Class

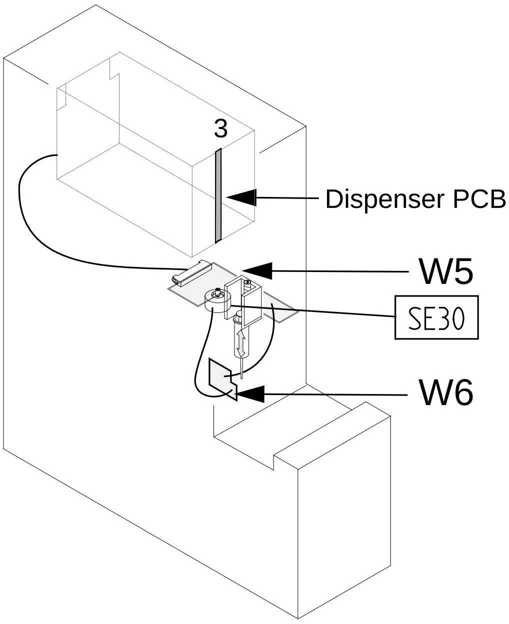
Dispenser 147 377/2 revision 07

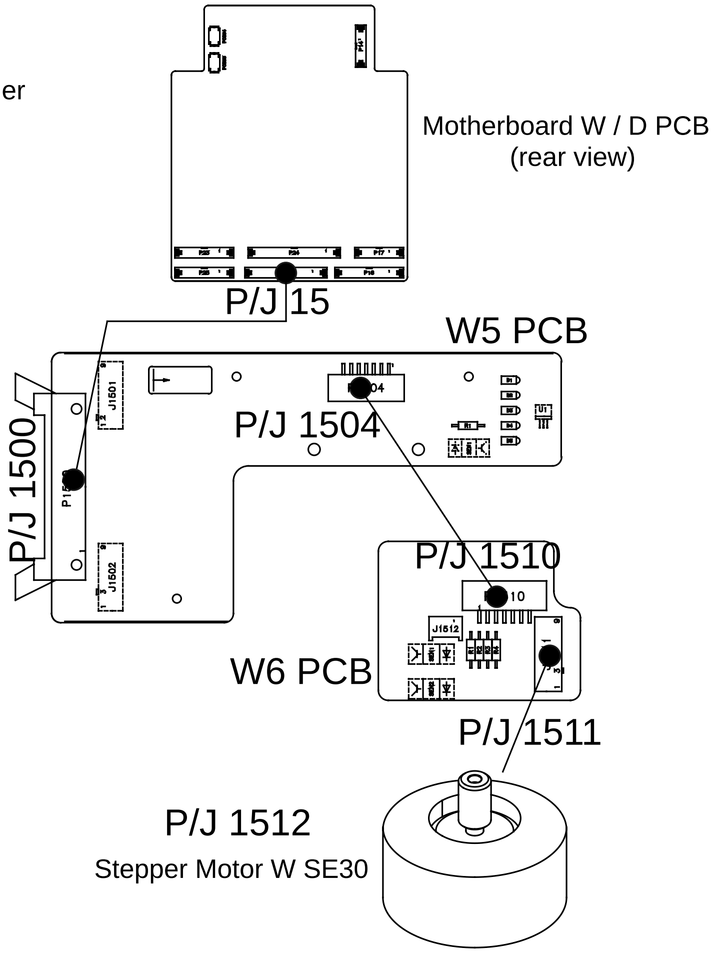

110(A)
22
23(B)
24(B)
21
131
130
128 ▣ 124(T)
W9
25(A)
132
20
10(A)
117 ▣ 124
116
8
32 ▣
20
13
▣
128
14
15
14
19
5
13
115
26
4 ▣ 123
36
119 ▣ 124
39
43
128
41 ▣ 124
42 ▣ 123
34
43
127
49
98
127
128
48
127
129
128
109(A)
103
136
50(B)
44
▣
127
33(B)
114
47
22
113
132
110(A)
31 ▣
45
102
22
92
23(B)
24(B)
131
130
119 ▣ 124
35
W6
101(A)
138
29
1 ▣ 144 / 145
28 ▣ 123
91
27
90
3
139 ▣ 124
2 ▣ 123
106
119 ▣ 124(T)
128
▣
84
86
85
127
105
129
127
137 ▣ 124
107
87
57(C)
82
119 ▣ 124
119 ▣ 124(T)
58 ▣ 150
59 ▣ 150
76
137 ▣ 124
81
42 ▣ 123
137 ▣ 124
7
▣
59 ▣ 150
50(B)
99 ▣ 124
83
76
63 ▣ 123
77

4.3.7 Troubleshooting

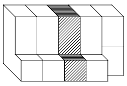
Module: Washer / Dispenser
Assembly: Dispenser
Actor: Stepper Motor with integrated Encoder
SE30 Dosing Drive
Boards: W5, W6, Dispenser PCB
Motherboard W / D
Error Message:

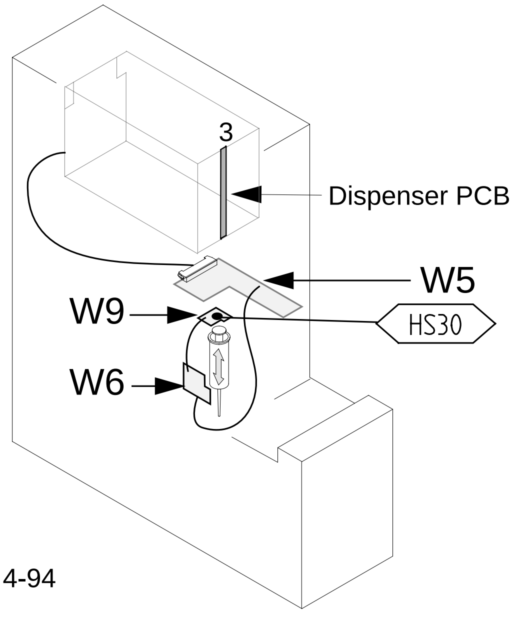


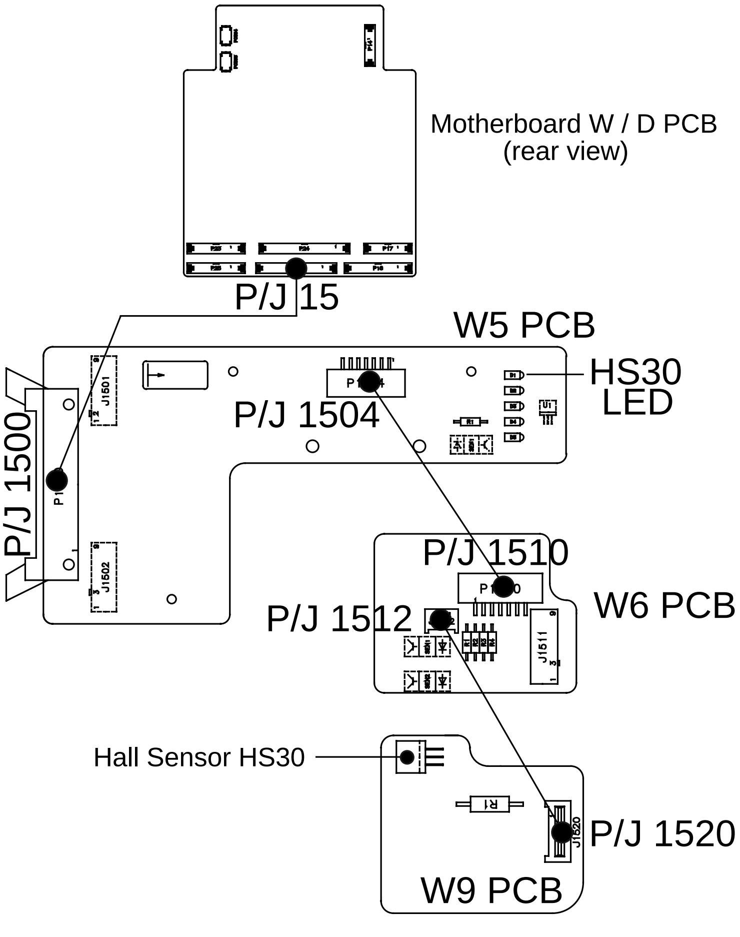

3
Dispenser PCB
W5
SE30
W6


Motherboard W / D PCB
(rear view)
P/J 15
W5 PCB
P/J 1504
P/J 1500
J1501
J1502
P/J 1510
W6 PCB
J1512
P/J 1511
P/J 1512
Stepper Motor W SE30

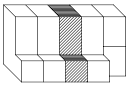
Module: Washer / Dispenser
Assembly: Dispenser
Sensor: Hall Sensor HS30
Dosing Drive Initialization
Boards: W5, W6, W9, Dispenser PCB
Motherboard W / D
Error Message:

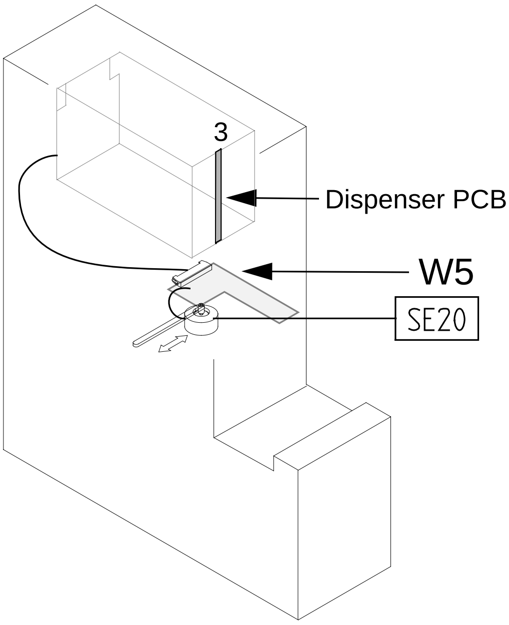


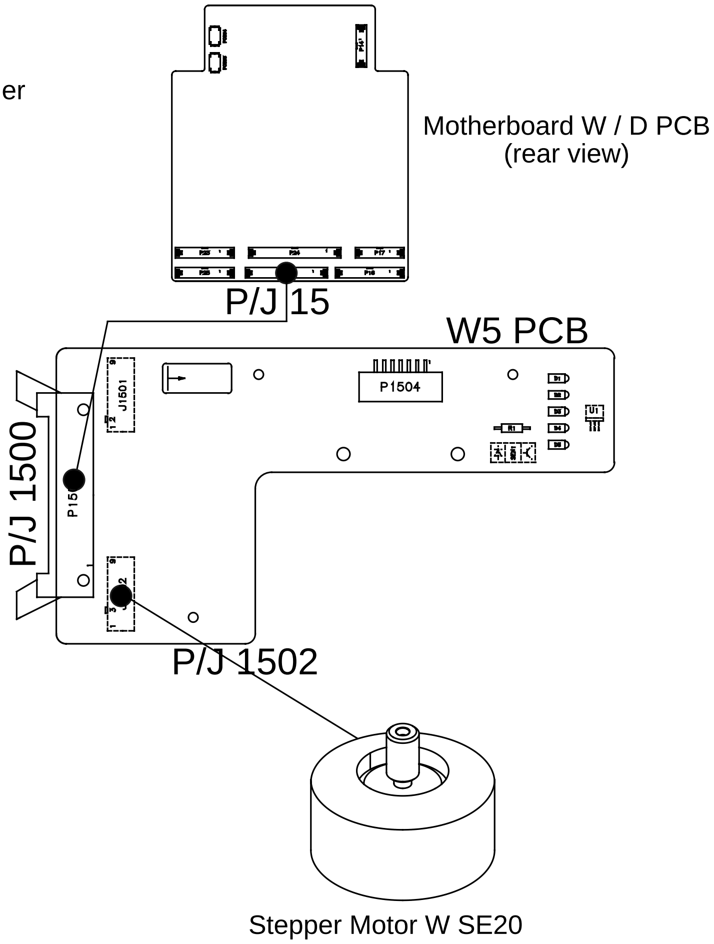

3
Dispenser PCB
W5
W9
HS30
W6


Motherboard W / D PCB
(rear view)
P/J 15
W5 PCB
HS30
LED
P/J 1504
P/J 1500
J1501
J1502
P/J 1510
P/J 1512
W6 PCB
J1511
Hall Sensor HS30
P/J 1520
W9 PCB

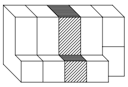
Module: Washer / Dispenser
Assembly: Dispenser
Actor: Stepper Motor with integrated Encoder
SE20 Dosing Arm X - Movement
Boards: W5, Dispenser PCB
Motherboard W / D
Error Message:

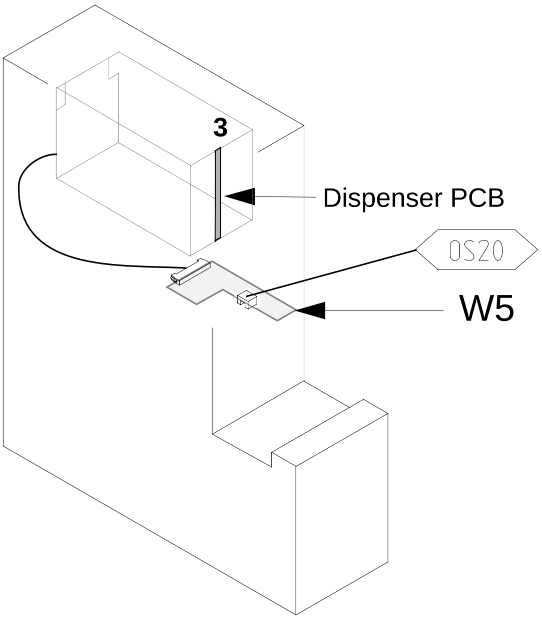


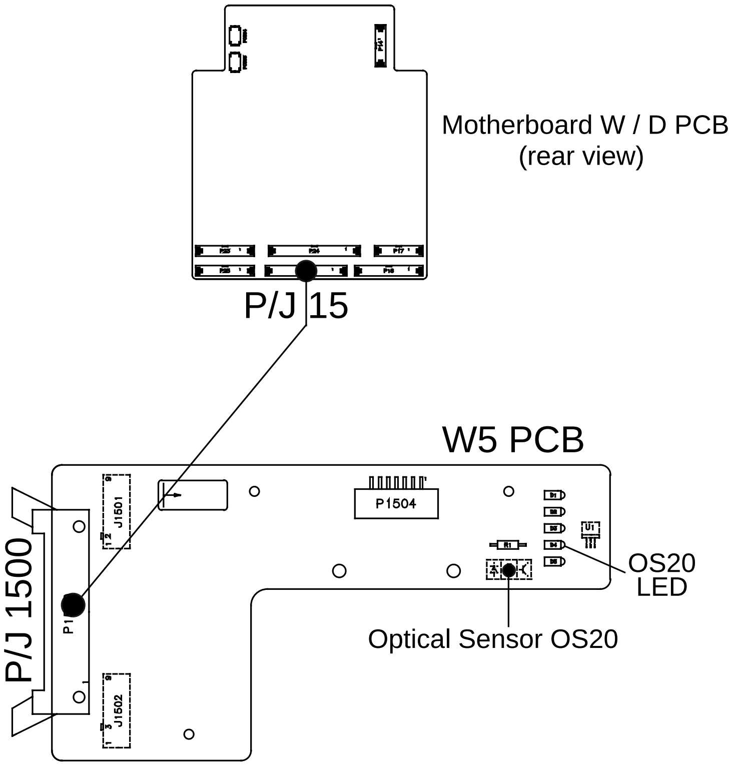

3
Dispenser PCB
W5
SE20


Motherboard W / D PCB
(rear view)
P/J 15
W5 PCB
P1504
J1501
P/J 1500
P15
P/J 1502
Stepper Motor W SE20

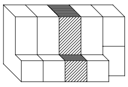
Module: Washer / Dispenser
Assembly: Dispenser
Sensor: Optical Sensor OS20
X-Movement
Boards: W5, Dispenser PCB
Motherboard W / D
Error Message:

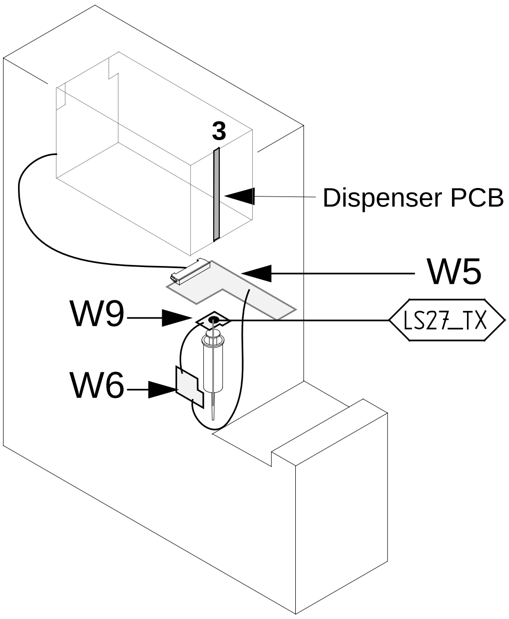


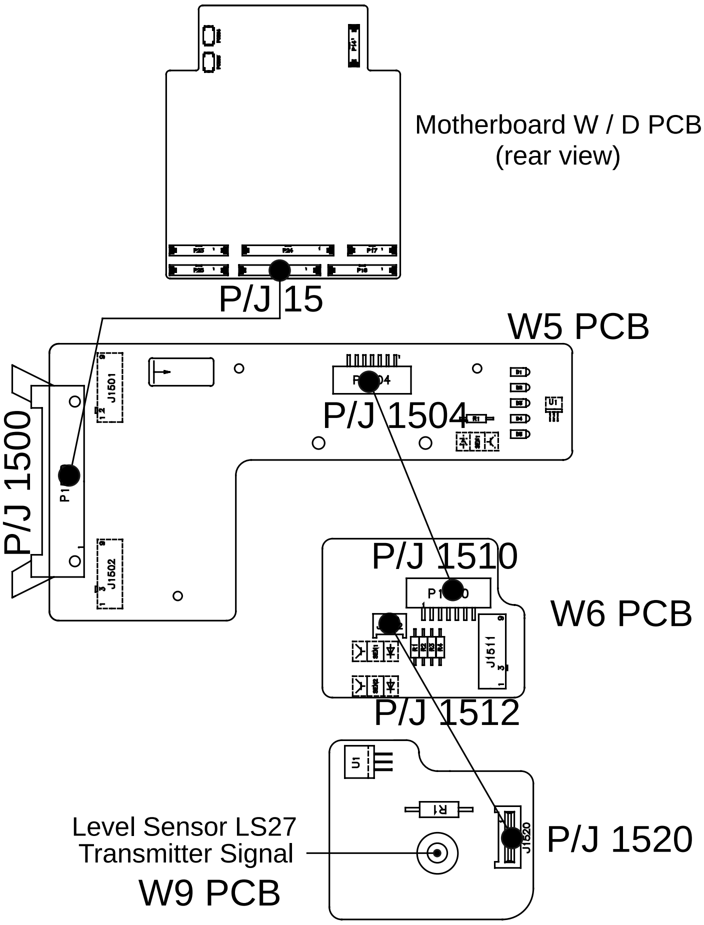

3
Dispenser PCB
OS20
W5


Motherboard W / D PCB
(rear view)
P/J 15
W5 PCB
P1504
J1501
P/J 1500
J1502
OS20
LED
Optical Sensor OS20

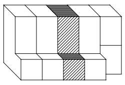
Module: Washer / Dispenser
Assembly: Dispenser
Sensor: Level Sensor LS27
Transmitter Signal (TX)
Boards: W5, W6, W9, Dispenser PCB
Motherboard W / D
Error Message:

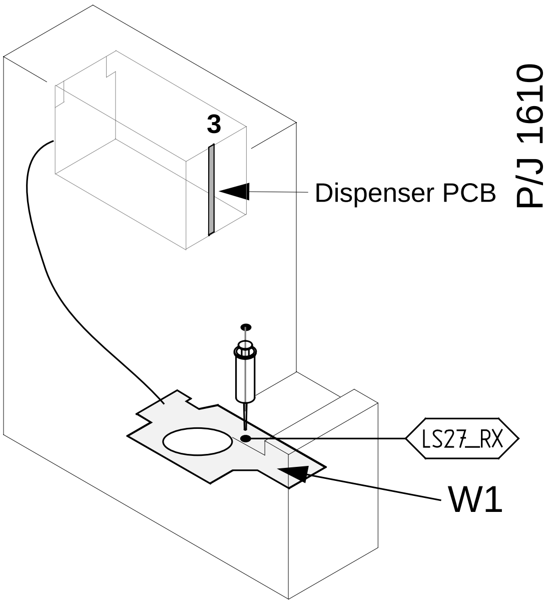


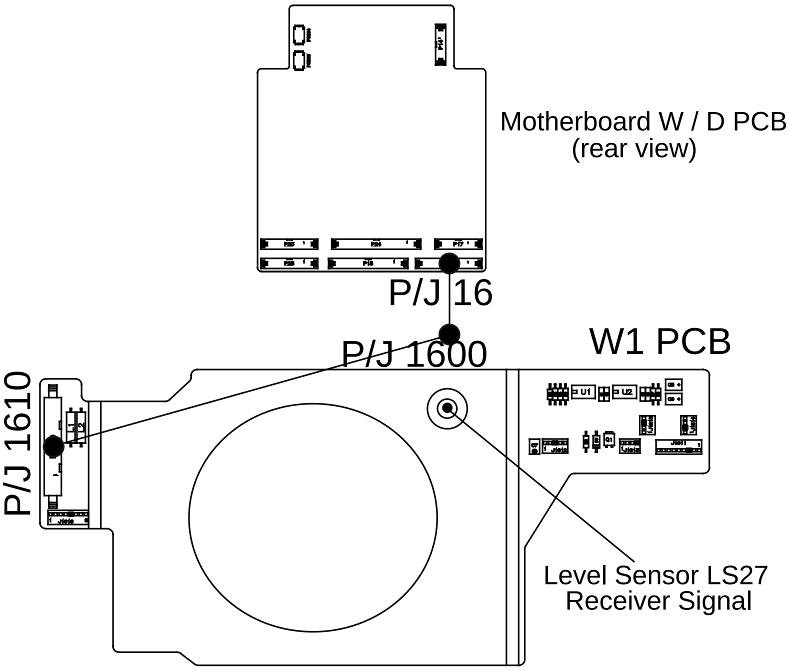

3
Dispenser PCB
W5
W9
LS27_TX
W6

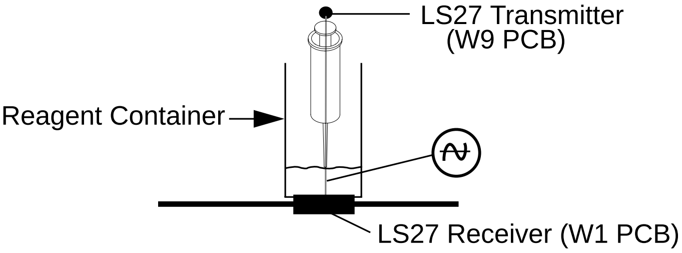

Motherboard W / D PCB
(rear view)
P/J 15
W5 PCB
P/J 1500
P/J 1504
P/J 1510
W6 PCB
P/J 1512
P/J 1520
Level Sensor LS27
Transmitter Signal
W9 PCB

Module: Washer / Dispenser
Assembly: Dispenser
Sensor: Level Sensor LS27
Receiver Signal (RX)
Boards: W1, Dispenser PCB
Motherboard W / D
Error Message:

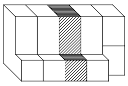


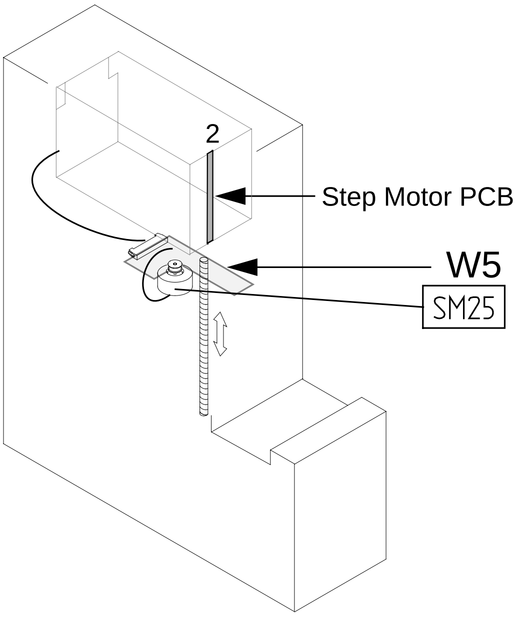

3
Dispenser PCB
LS27_RX
W1

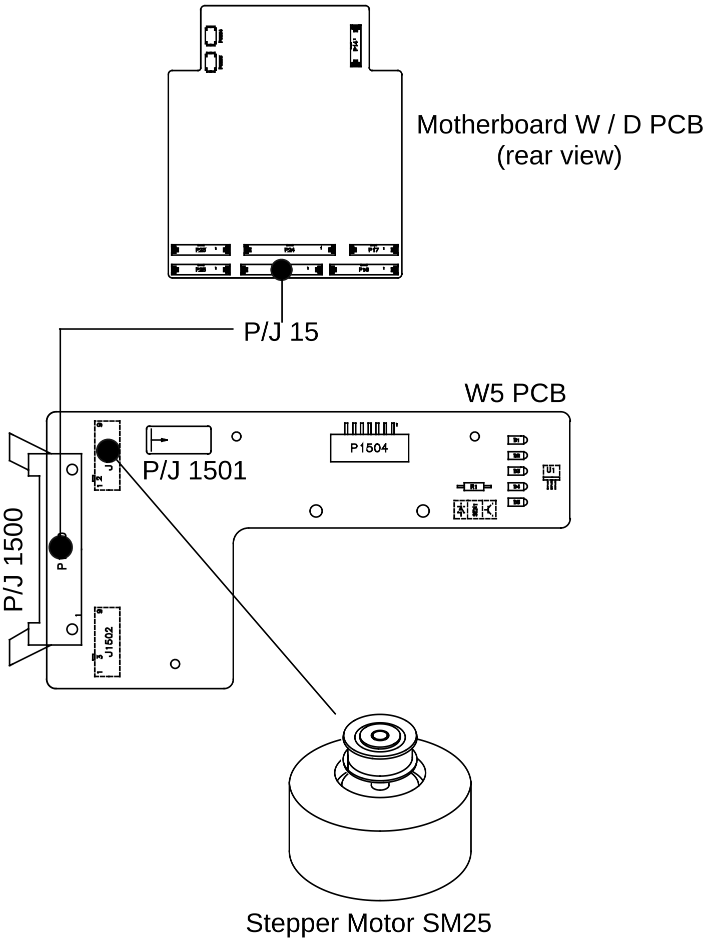

Motherboard W / D PCB
(rear view)
P/J 16
P/J 1600
W1 PCB
P/J 1610
Level Sensor LS27
Receiver Signal


LS27 Transmitter
(W9 PCB)
Reagent Container
LS27 Receiver (W1 PCB)

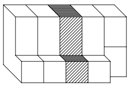
Module: Washer / Dispenser
Assembly: Dispenser
Actor: Stepper Motor SM25
Dosing Arm Z-Movement
Boards: W5, Step Motor PCB
Motherboard W / D
Error Message:

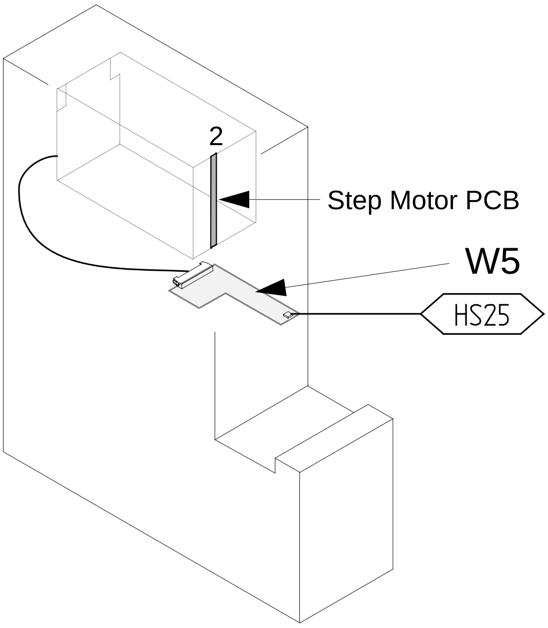


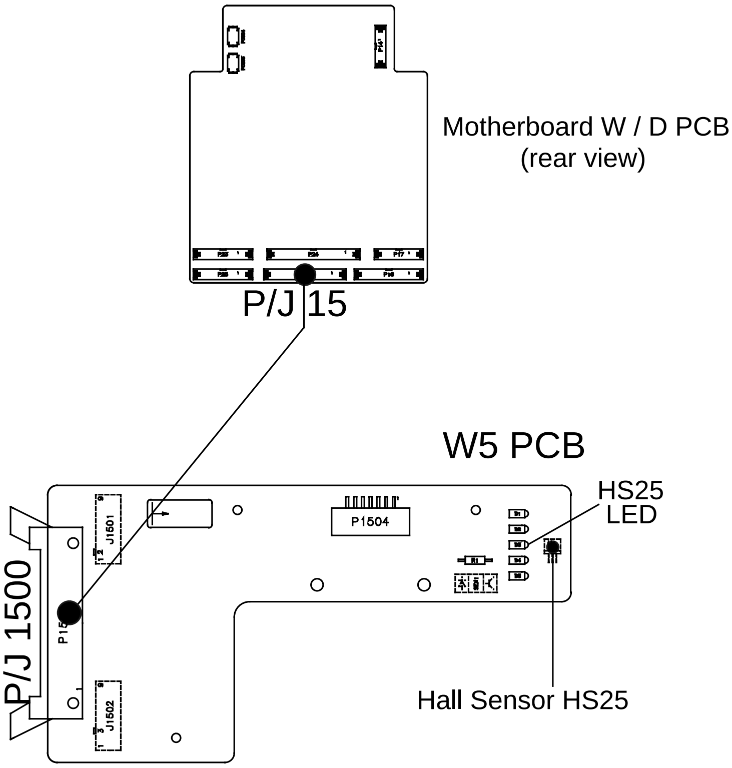

2
Step Motor PCB
W5
SM25


Motherboard W / D PCB
(rear view)
P/J 15
W5 PCB
P/J 1501
P1504
P/J 1500
J1502
Stepper Motor SM25

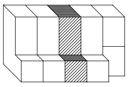
Module: Washer / Dispenser
Assembly: Dispenser
Sensor: Hall Sensor HS25
Z-Movement
Boards: W5, Step Motor PCB
Motherboard W / D
Error Message:

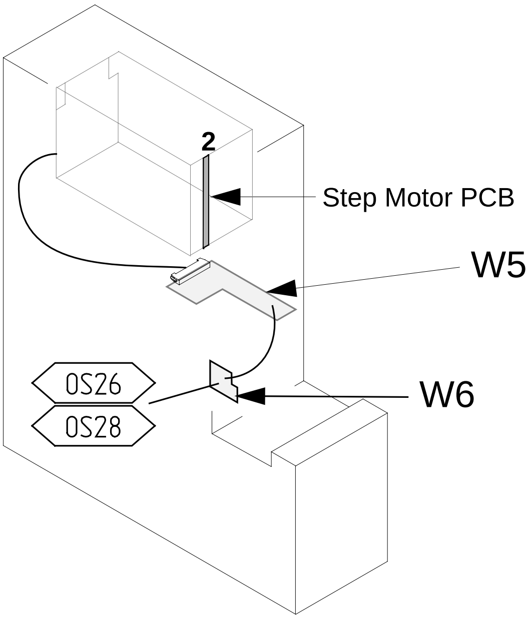


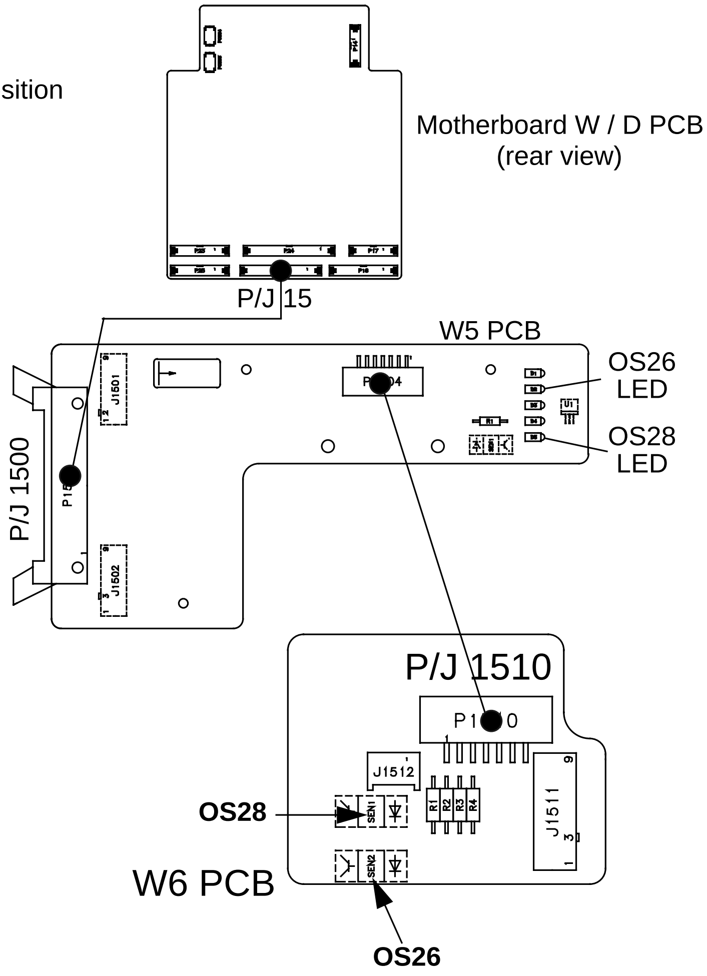

2
Step Motor PCB
W5
HS25


Motherboard W / D PCB
(rear view)
P/J 15
W5 PCB
HS25
LED
J1501
P1504
P/J 1500
J1502
Hall Sensor HS25

Module:	Washer / Dispenser
Assembly:	Dispenser
Sensors:	Optical Sensor OS28 Syringe Tip Position & OS26 Dosing Arm Z-Movement
Boards:	W5, W6, Step Motor PCB Motherboard W / D
Error Message:	




2
Step Motor PCB
W5
W6
OS26
OS28


Motherboard W / D PCB
(rear view)
P/J 15
W5 PCB
OS26
LED
OS28
LED
P/J 1500
J1501
J1502
P1504
P/J 1510
P1510
J1512
J1511
R1
R2
R3
R4
SEN1
SEN2
OS28
W6 PCB
OS26

Reagent Drawer

147 251

Functional Description

Connector Boards

W1	146 195
W2	146 197
W4	146 201

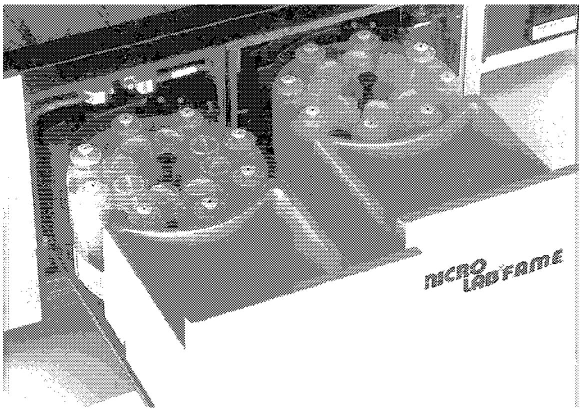
Wiring Diagram

Replacing Spare Parts

Spare Parts List

3D Drawing

Troubleshooting



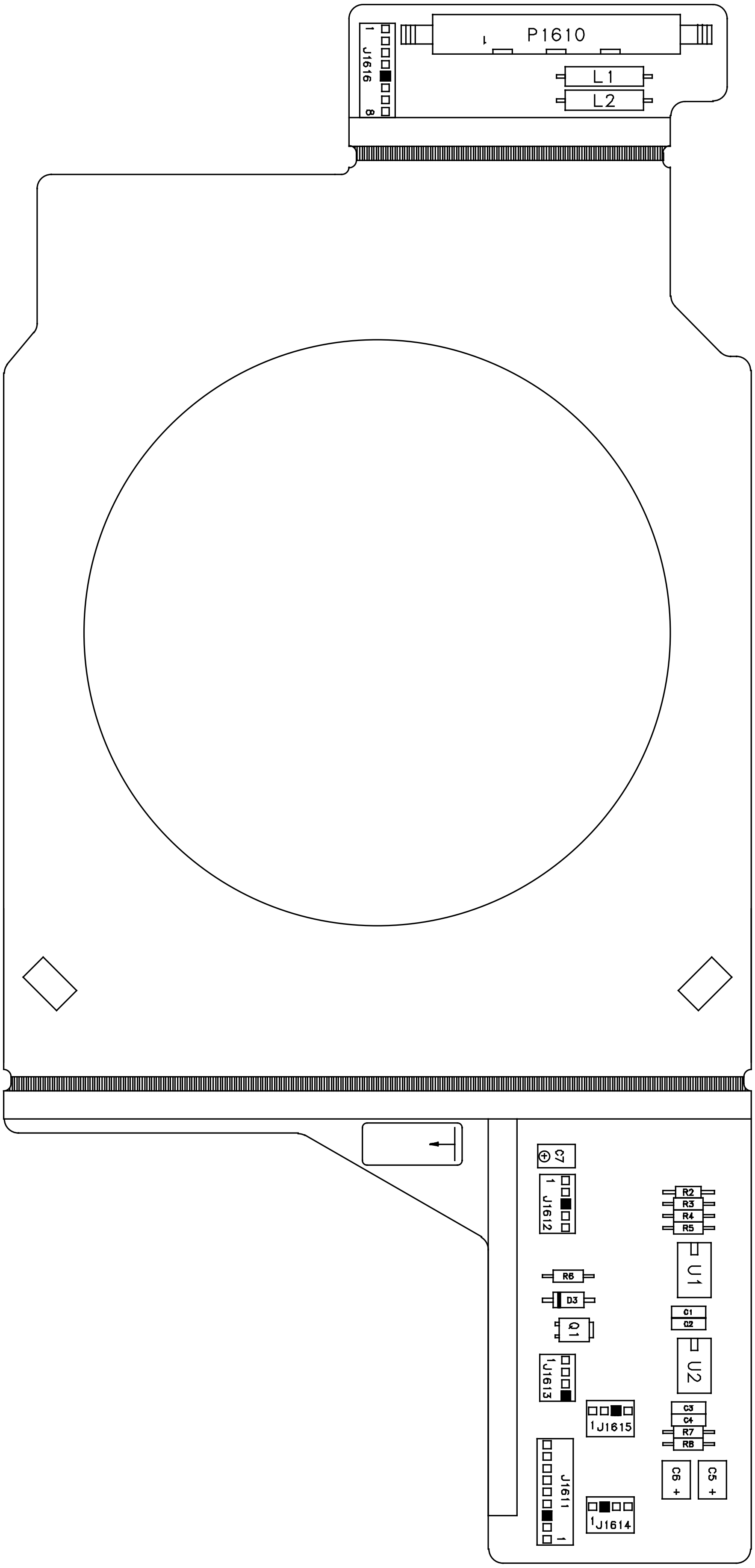
MICRO LAB FAME

4.4 Reagent Drawer 147 251

4.4.1 Functional Description

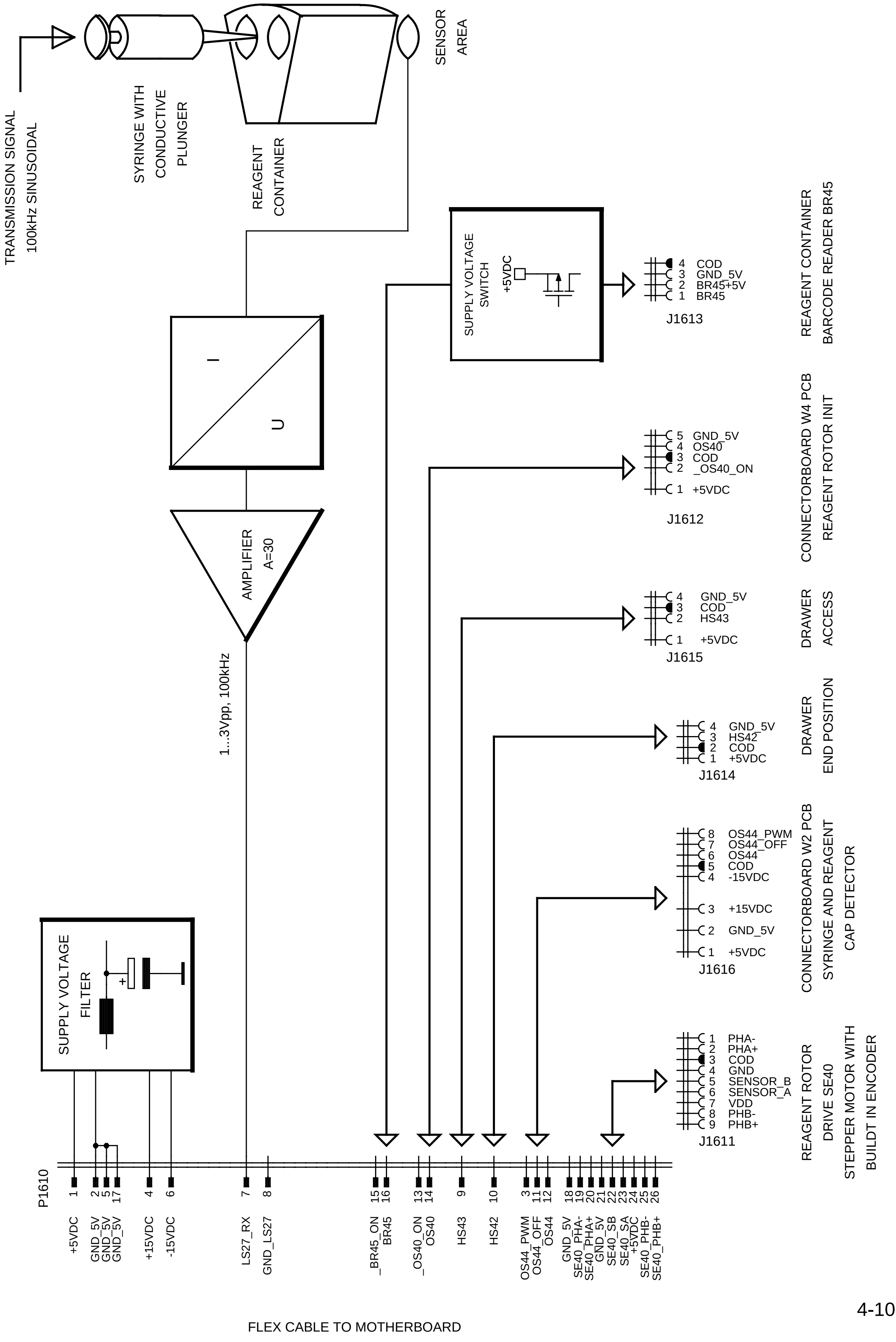
4.4.2 Connector Boards

Connector Board W1 PCB Component Layout 146.195 revision 02


P1610
1
1
J1616
8
L1
L2
C7
1
J1612
R2
R3
R4
R5
U1
R6
D3
Q1
C1
C2
U2
1
J1613
J1615
1
C3
C4
R7
R8
J1611
1
C6
C5
J1614
1

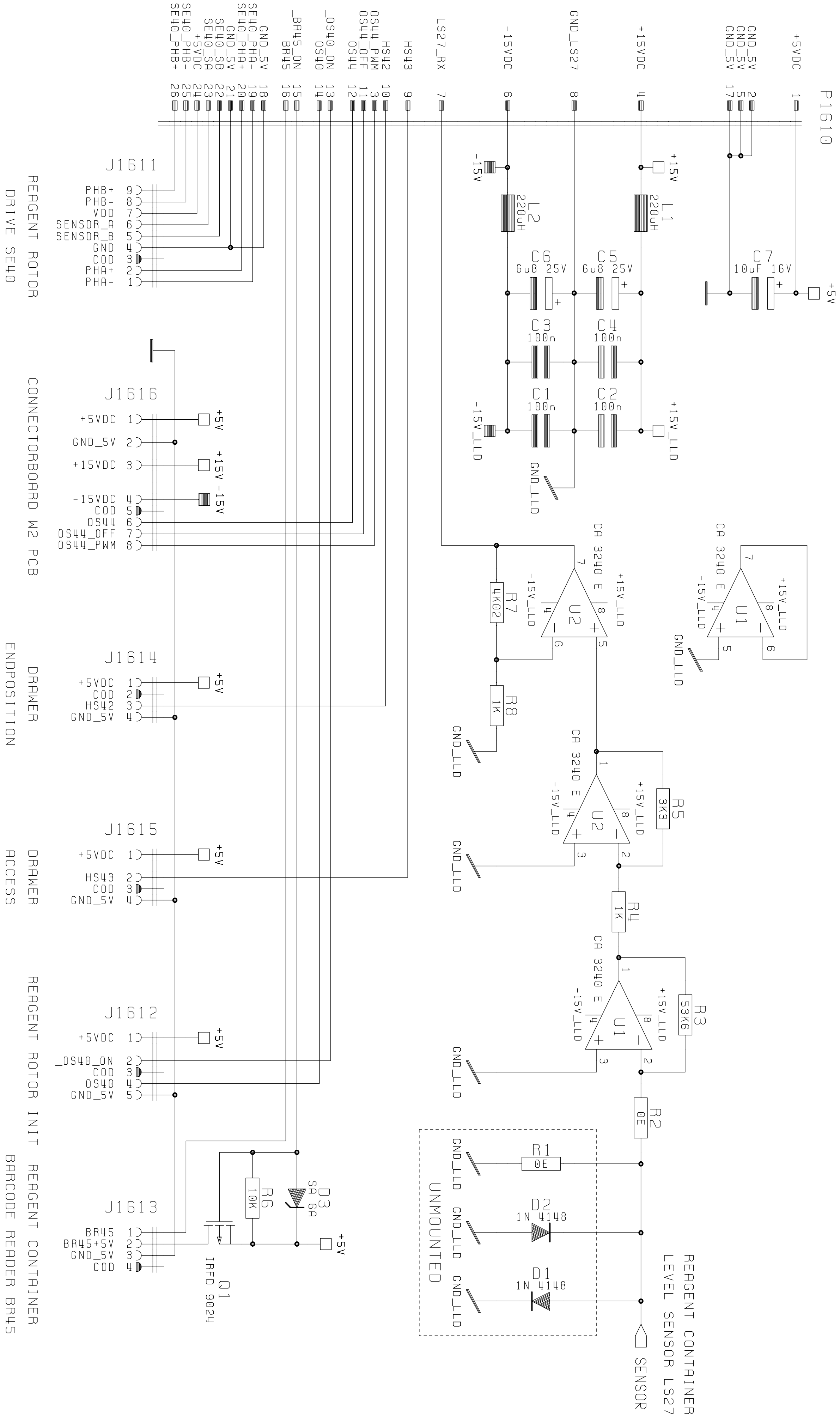
Connector Board W1 PCB Block Diagram

Reagent Container Level Sensor, Drawer Main PCB 614.129 revision 00

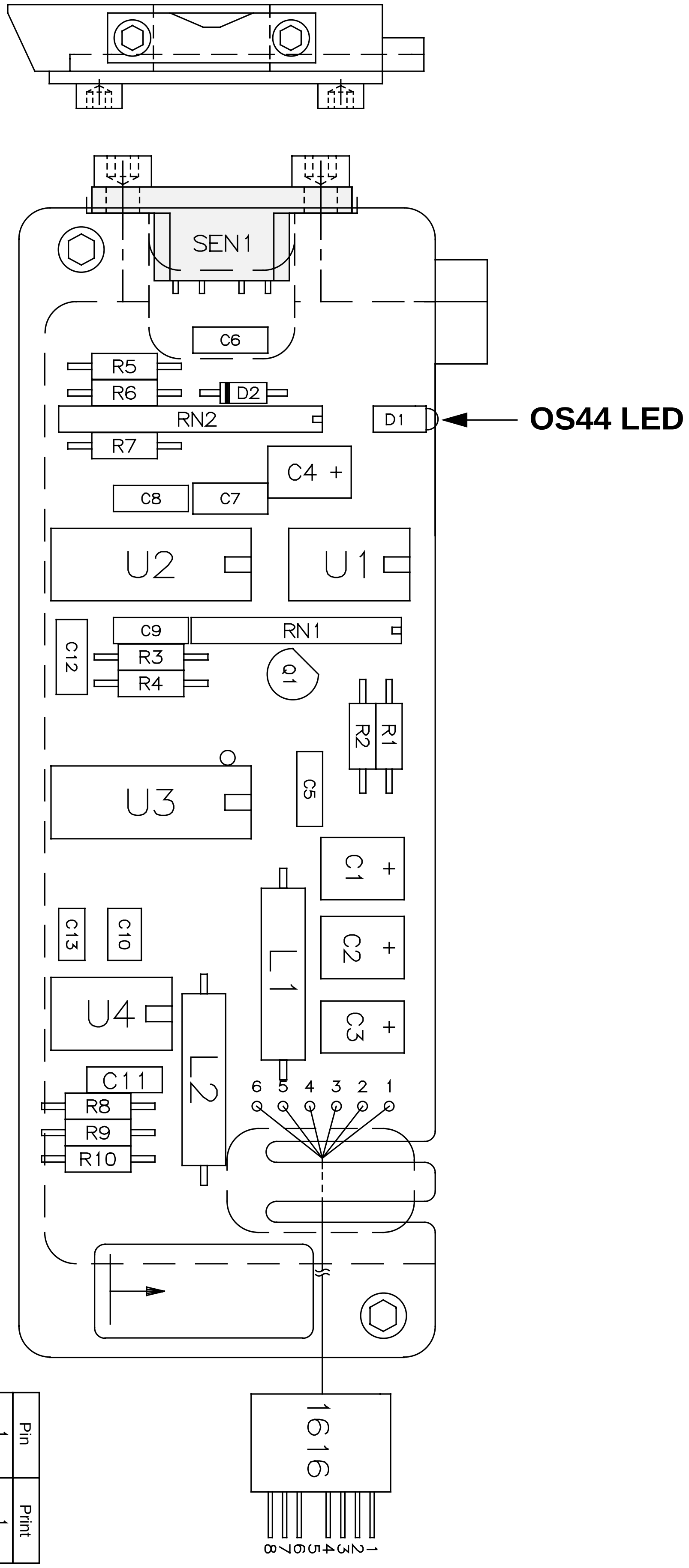

TRANSMISSION SIGNAL
100kHz SINUSOIDAL
SYRINGE WITH
CONDUCTIVE
PLUNGER
REAGENT
CONTAINER
SENSOR
AREA
I
U
AMPLIFIER
A=30
1...3Vpp, 100kHz
SUPPLY VOLTAGE
SWITCH
+5VDC
4 COD
3 GND_5V
2 BR45+5V
1 BR45
J1613
REAGENT CONTAINER
BARCODE READER BR45
5 GND_5V
4 OS40
3 COD
2 _OS40_ON
1 +5VDC
J1612
CONNECTORBOARD W4 PCB
REAGENT ROTOR INIT
4 GND_5V
3 COD
2 HS43
1 +5VDC
J1615
DRAWER
ACCESS
4 GND_5V
3 HS42
2 COD
1 +5VDC
J1614
DRAWER
END POSITION
8 OS44_PWM
7 OS44_OFF
6 OS44
5 COD
4 -15VDC
3 +15VDC
2 GND_5V
1 +5VDC
J1616
CONNECTORBOARD W2 PCB
SYRINGE AND REAGENT
CAP DETECTOR
1 PHA-
2 PHA+
3 COD
4 GND
5 SENSOR_B
6 SENSOR_A
7 VDD
8 PHB-
9 PHB+
J1611
REAGENT ROTOR
DRIVE SE40
STEPPER MOTOR WITH
BUILDT IN ENCODER
SUPPLY VOLTAGE
FILTER
+
P1610
1 +5VDC
2 GND_5V
5 GND_5V
17 GND_5V
4 +15VDC
6 -15VDC
7 LS27_RX
8 GND_LS27
15 _BR45_ON
16 BR45
13 _OS40_ON
14 OS40
9 HS43
10 HS42
3 OS44_PWM
11 OS44_OFF
12 OS44
18 GND_5V
19 SE40_PHA-
20 SE40_PHA+
21 GND_5V
22 SE40_SB
23 SE40_SA
24 +5VDC
25 SE40_PHB-
26 SE40_PHB+
FLEX CABLE TO MOTHERBOARD

Connector Board W1 PCB

Drawer Main, Connector Board 604.810 revision 01


P1610
+5VDC 1
GND_5V 2
GND_5V 5
GND_5V 17
+15VDC 4
GND_LS27 8
-15VDC 6
LS27_RX 7
HS43 9
HS42 10
OS44_PWM 3
OS44_OFF 11
OS44 12
_OS40_ON 13
OS40 14
_BR45_ON 15
BR45 16
GND_5V 18
SE40_PHA- 19
SE40_PHA+ 20
GND_5V 21
SE40_SB 22
SE40_SA 23
+5VDC 24
SE40_PHB- 25
SE40_PHB+ 26
J1611
PHB+ 9
PHB- 8
VDD 7
SENSOR_A 6
SENSOR_B 5
GND 4
COD 3
PHA+ 2
PHA- 1
REAGENT ROTOR DRIVE SE40
J1616
+5VDC 1
GND_5V 2
+15VDC 3
-15VDC 4
COD 5
OS44 6
OS44_OFF 7
OS44_PWM 8
CONNECTORBOARD W2 PCB
J1614
+5VDC 1
COD 2
HS42 3
GND_5V 4
DRAWER ENDPOSITION
J1615
+5VDC 1
HS43 2
COD 3
GND_5V 4
DRAWER ACCESS
J1612
+5VDC 1
_OS40_ON 2
COD 3
OS40 4
GND_5V 5
REAGENT ROTOR INIT
J1613
BR45 1
BR45+5V 2
GND_5V 3
COD 4
REAGENT CONTAINER BARCODE READER BR45
+5V
+15V
-15V
L1 220uH
L2 220uH
C5 6u8 25V
C6 6u8 25V
C7 10uF 16V
C3 100n
C4 100n
C1 100n
C2 100n
+15V_LLD
-15V_LLD
GND_LLD
CA 3240 E
U1
U2
R7 4K02
R8 1K
R5 3K3
R4 1K
R3 53K6
R2 0E
R1 0E
D2 1N 4148
D1 1N 4148
UNMOUNTED
R6 10K
D3 SA 6A
Q1 IRFD 9024
SENSOR
REAGENT CONTAINER LEVEL SENSOR LS27

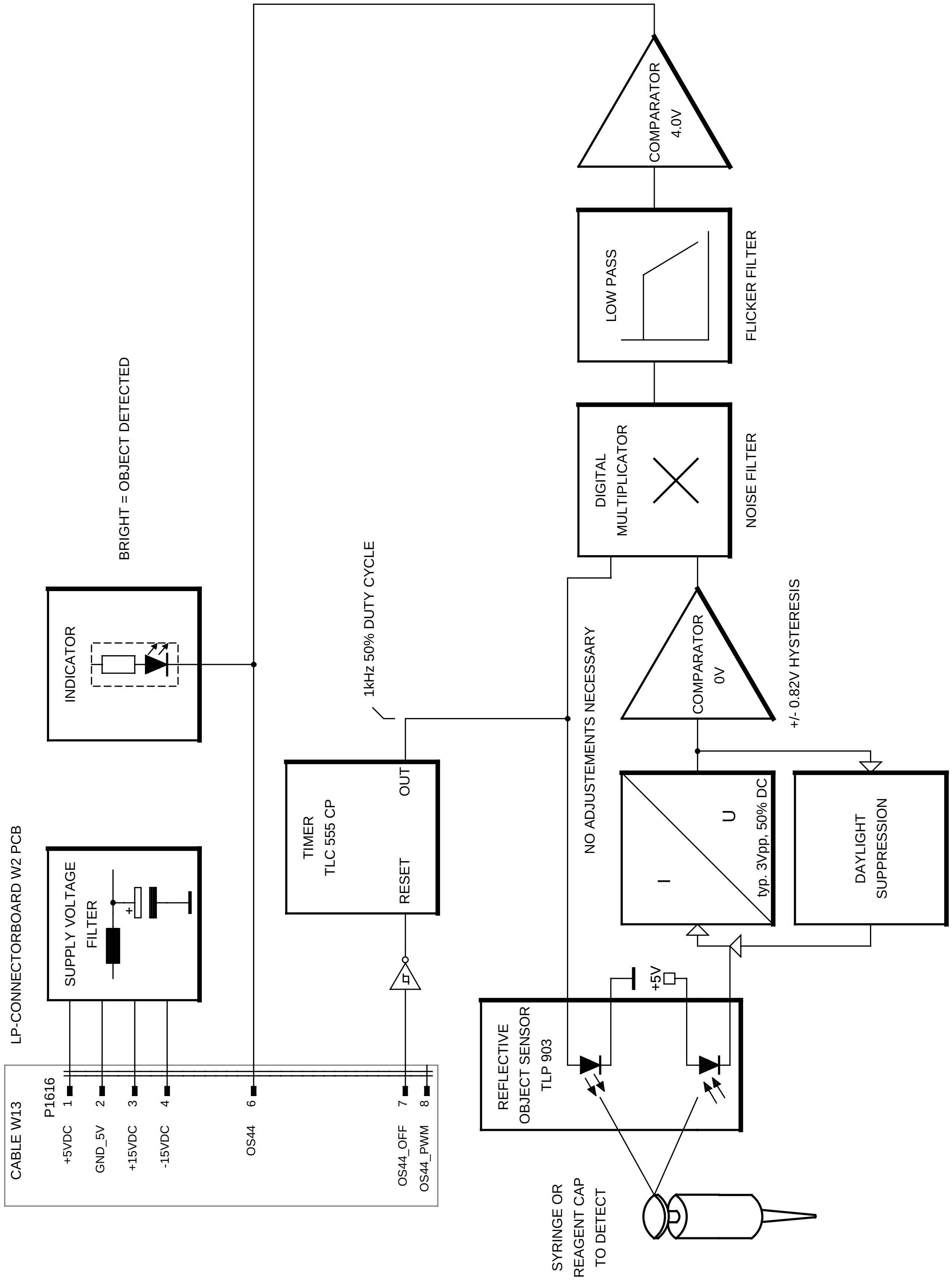
Connector Board W2 PCB Component Layout 146.197 revision 00


SEN1
C6
R5
R6
D2
RN2
D1
OS44 LED
R7
C4 +
C8
C7
U2
U1
C9
RN1
C12
R3
R4
Q1
R2
R1
U3
C5
C1 +
C13
C10
C2 +
L1
U4
C3 +
L2
C11
6 5 4 3 2 1
R8
R9
R10
1616
1 2 3 4 5 6 7 8

Pin	Print
1	1
2	2
3	3
4	4
5	–
6	5
7	6
8	–

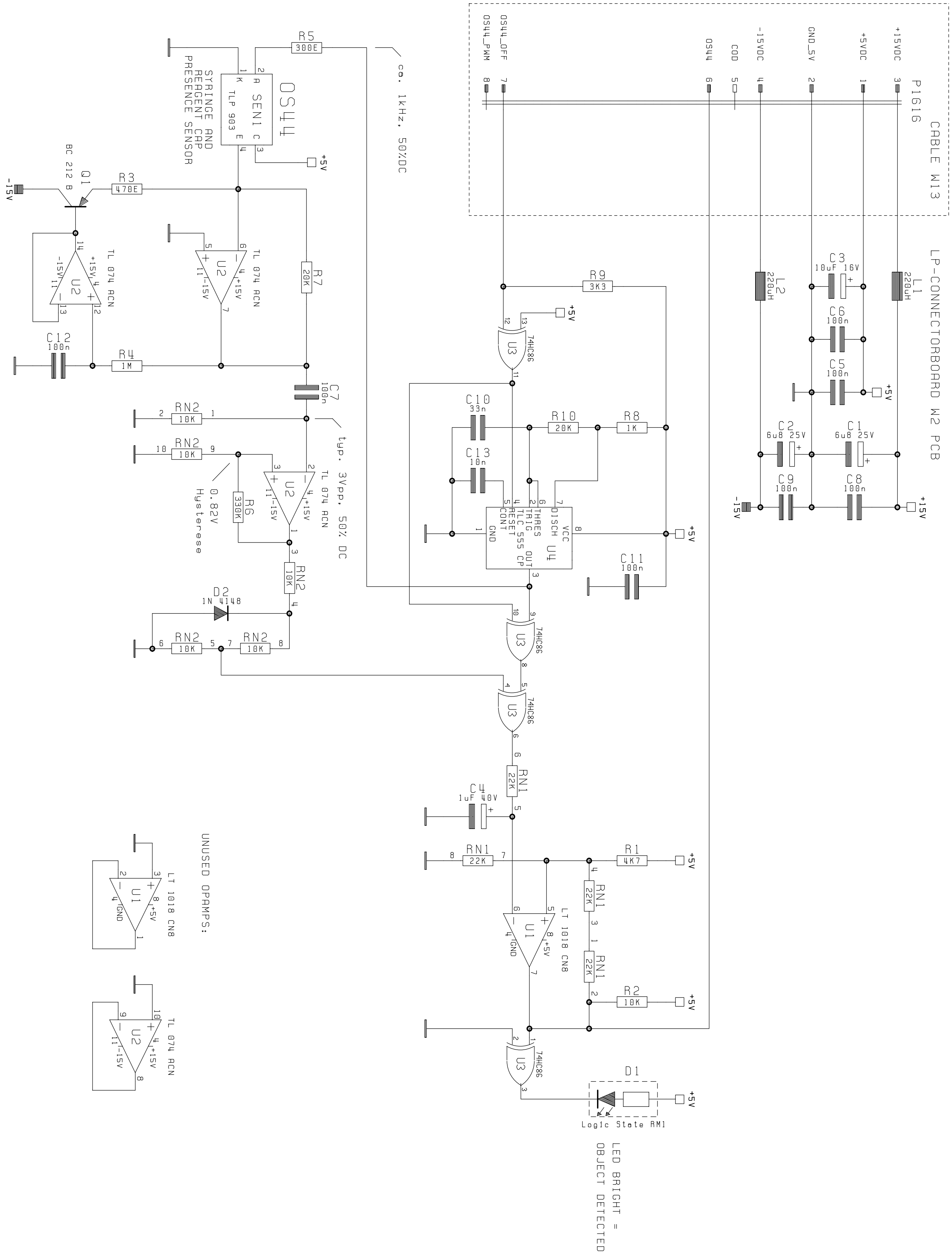
Connector Board W2 PCB Block Diagram

Syringe and Reagent Cap Detector OS44 614.130 revision 00

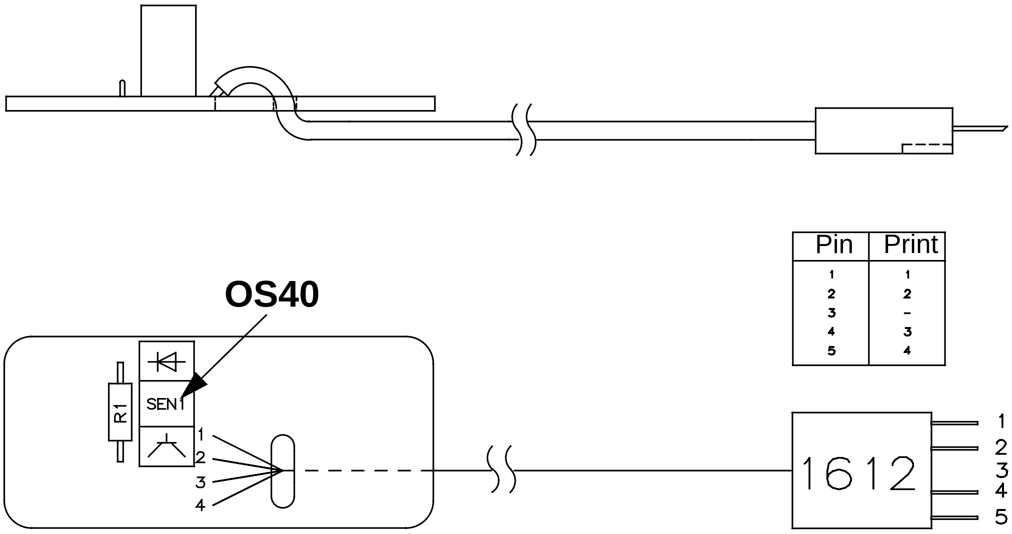

COMPARATOR
4.0V
LOW PASS
FLICKER FILTER
DIGITAL
MULTIPLICATOR
NOISE FILTER
BRIGHT = OBJECT DETECTED
INDICATOR
1kHz 50% DUTY CYCLE
NO ADJUSTEMENTS NECESSARY
COMPARATOR
0V
+/- 0.82V HYSTERESIS
TIMER
TLC 555 CP
OUT
RESET
I
U
typ. 3Vpp, 50% DC
DAYLIGHT
SUPPRESSION
LP-CONNECTORBOARD W2 PCB
SUPPLY VOLTAGE
FILTER
+
+5V
REFLECTIVE
OBJECT SENSOR
TLP 903
CABLE W13
P1616
1
2
3
4
6
7
8
+5VDC
GND_5V
+15VDC
-15VDC
OS44
OS44_OFF
OS44_PWM
SYRINGE OR
REAGENT CAP
TO DETECT

Connector Board W2 PCB Syringe & Reagent Cap Presence Sensor

604.811 revision 01


R5 300E
OS44
A SEN1 C
K TLP 903 E
SYRINGE AND REAGENT CAP PRESENCE SENSOR
ca. 1kHz, 50%DC
+5V
Q1 BC 212 B
R3 470E
-15V
U2 TL 074 ACN
R7 20K
C12 100n
R4 1M
C7 100n
RN2 10K
typ. 3Vpp, 50% DC
0.82V Hysterese
R6 330K
D2 1N 4148
U3 74HC86
R9 3K3
C10 33n
C13 10n
R10 20K
R8 1K
U4 TLC 555 CP
THRES TRIG RESET CONT GND
DISCH VCC OUT
C11 100n
RN1 22K
C4 1uF 40V
R1 4K7
R2 10K
U1 LT 1018 CN8
D1
Logic State RM1
LED BRIGHT = OBJECT DETECTED
UNUSED OPAMPS:
P1G16
CABLE W13
OS44_PWM
OS44_OFF
OS44
COD
-15VDC
GND_5V
+5VDC
+15VDC
LP-CONNECTORBOARD W2 PCB
C3 10uF 16V
L2 220uH
L1 220uH
C6 100n
C5 100n
C2 6u8 25V
C1 6u8 25V
C9 100n
C8 100n
+15V

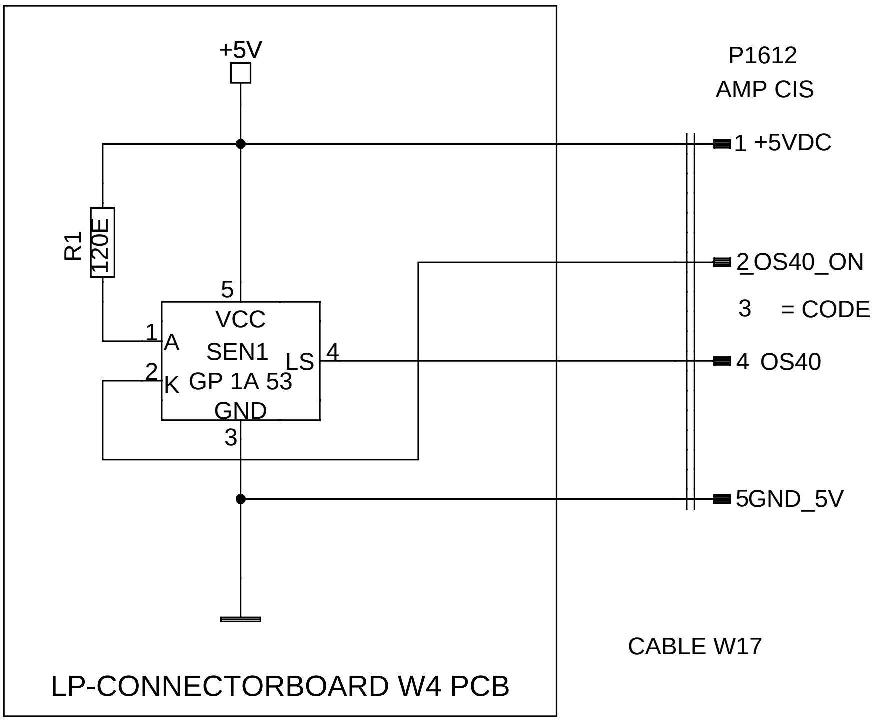
Connector Board W4 PCB Component Layout 146.201 revision 00


OS40
R1
SEN1
1
2
3
4
1612
1
2
3
4
5

Pin	Print
1	1
2	2
3	-
4	3
5	4

Connector Board W4 PCB

Reagent Rotor Init. Sensor, OS40 604.813 revision 00


+5V
P1612
AMP CIS
1 +5VDC
R1
120E
2 OS40_ON
3 = CODE
5
VCC
1
A
SEN1
LS
4
4 OS40
2
K
GP 1A 53
GND
3
5GND_5V
CABLE W17
LP-CONNECTORBOARD W4 PCB

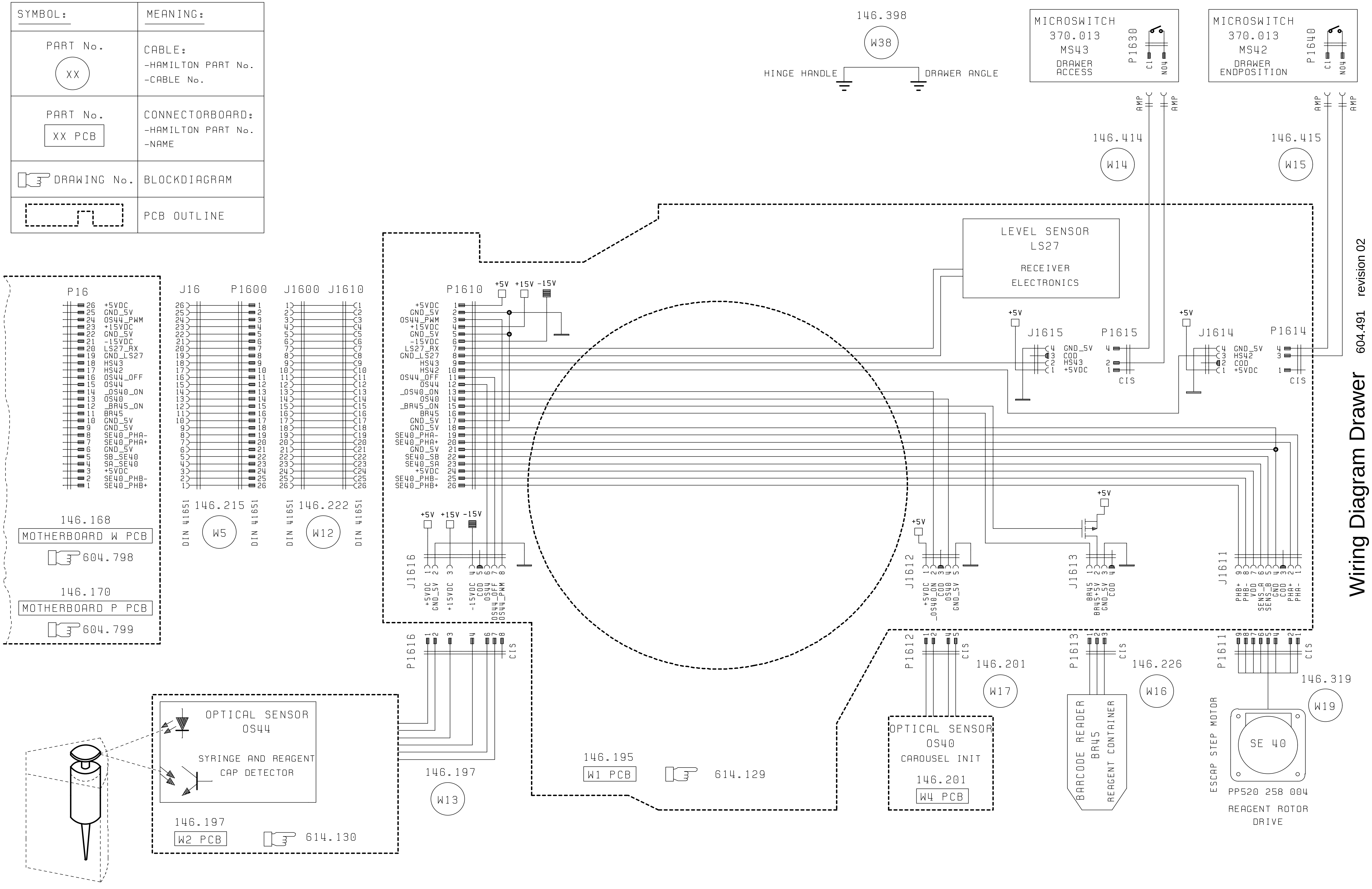
4.4.3 Wiring Diagram

Refer to the drawing on the following page:

❒ Drawer: Dwg No. 604 491

SYMBOL DESCRIPTION:

SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
☞ DRAWING No.	BLOCKDIAGRAM
	PCB OUTLINE



146.398
W38
HINGE HANDLE
DRAWER ANGLE
MICROSWITCH
370.013
MS43
DRAWER ACCESS
P1630
C1
NO4
MICROSWITCH
370.013
MS42
DRAWER ENDPOSITION
P1640
C1
NO4
AMP
146.414
W14
146.415
W15
LEVEL SENSOR
LS27
RECEIVER
ELECTRONICS
P16
26 +5VDC
25 GND_5V
24 OS44_PWM
23 +15VDC
22 GND_5V
21 -15VDC
20 LS27_RX
19 GND_LS27
18 HS43
17 HS42
16 OS44_OFF
15 OS44
14 _OS40_ON
13 OS40
12 _BR45_ON
11 BR45
10 GND_5V
9 GND_5V
8 SE40_PHA-
7 SE40_PHA+
6 GND_5V
5 SB_SE40
4 SA_SE40
3 +5VDC
2 SE40_PHB-
1 SE40_PHB+
J16
P1600
J1600
J1610
P1610
+5V
+15V
-15V
J1615
P1615
GND_5V
COD
HS43
+5VDC
CIS
J1614
P1614
GND_5V
HS42
COD
+5VDC
146.168
MOTHERBOARD W PCB
604.798
146.170
MOTHERBOARD P PCB
604.799
DIN 41651
146.215
W5
146.222
W12
J1616
+5VDC
GND_5V
+15VDC
-15VDC
COD
OS44
OS44_OFF
OS44_PWM
J1612
+5VDC
_OS40_ON
COD
OS40
GND_5V
J1613
BR45
BR45+5V
GND_5V
COD
J1611
PHB+
PHB-
VDD
SENS_A
SENS_B
GND
COD
PHA+
PHA-
P1616
P1612
P1613
P1611
146.201
W17
146.226
W16
146.319
W19
OPTICAL SENSOR
OS44
SYRINGE AND REAGENT
CAP DETECTOR
146.197
W13
146.197
W2 PCB
614.130
146.195
W1 PCB
614.129
OPTICAL SENSOR
OS40
CAROUSEL INIT
146.201
W4 PCB
BARCODE READER
BR45
REAGENT CONTAINER
ESCAP STEP MOTOR
SE 40
PP520 258 004
REAGENT ROTOR
DRIVE

Wiring Diagram Drawer 604.491 revision 02

4.4.4 Replacing spare parts

NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

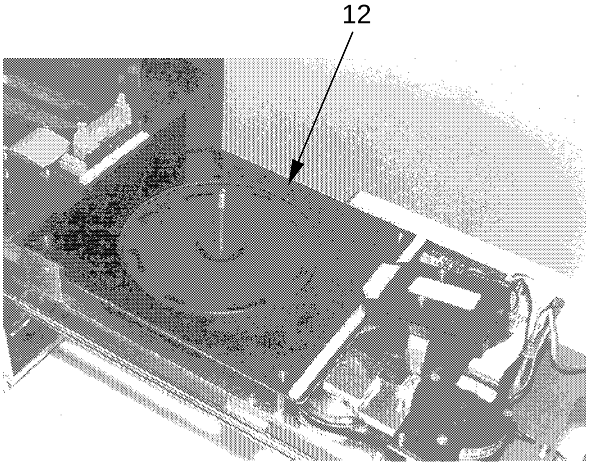
4.4.4.1 Connector board W1 PCB item 12

Remove *connector board W2 item 60* (see section 4.4.4.7).

Unscrew and remove *drawer compartment item 81* (see section 4.4.4.11).

Disconnect the 6 connectors on both ends of connector board W1.

Unscrew (6 screws) and replace connector board W1.



4.4.4.2 Reagent carousel support item 40

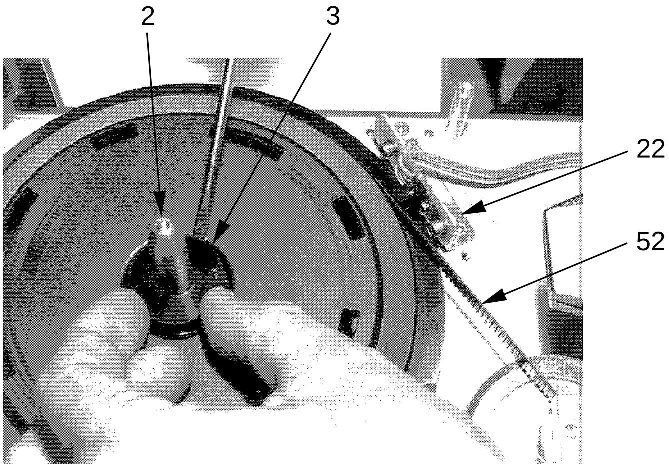
Remove *connector board W1 item 12* (see section 4.4.4.1).

Carefully lever out *protective cap item 3* using a screwdriver and remove *retaining ring item 72*.

Unscrew *support item 22* complete with *connector board W4 item 58*.

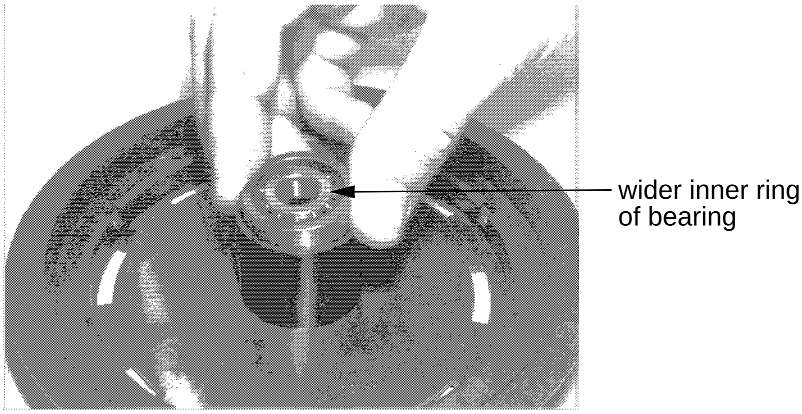
Remove *gear belt item 52* by turning reagent carousel support while gently pulling belt off of carousel support pulley.

Now lift the reagent carousel support off *carousel centering pin item 2* and extract the bearings.

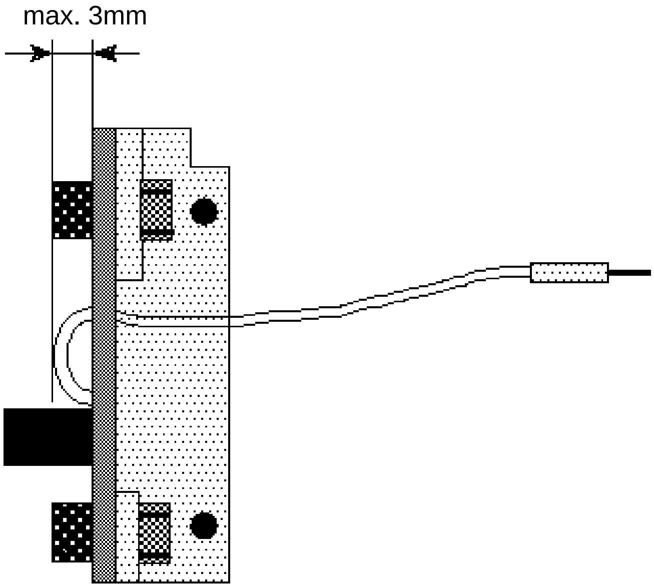


Remounting:

Insert the two bearings into the new reagent carousel support. The wider inner ring of the big bearing must face up.

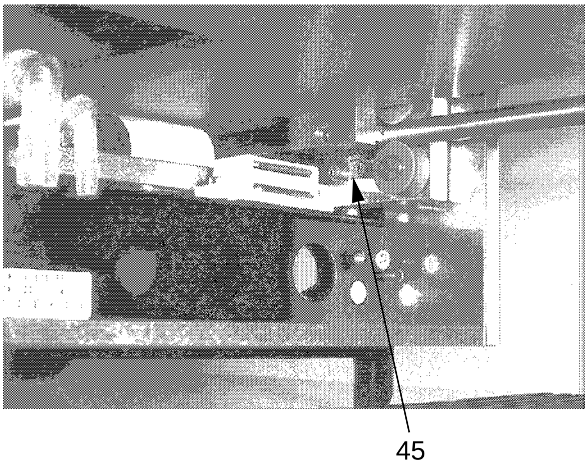


When installing *support item 22* complete with *connector board W4 item 58*, make sure that the cable does not touch the reagent carousel support. Adjust as follows:



4.4.4.3 Contact spring item 45

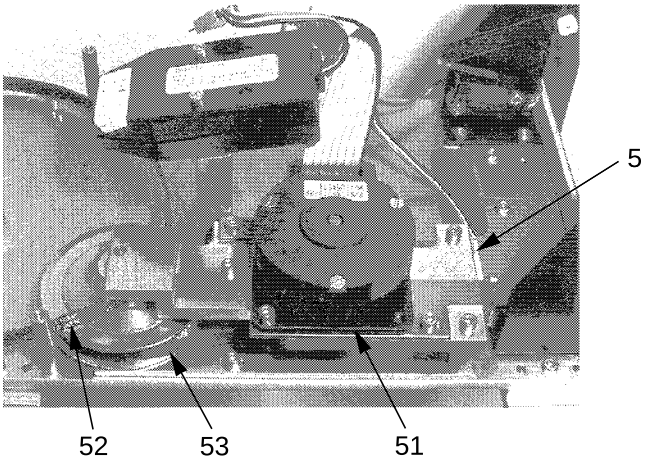
Open reagent drawer and unscrew / replace contact spring.



4.4.4.4 Step motor W SE40 item 51, Gear belts item 52 and 53

Remove *connector board W1 item 12* (see section 4.4.4.1).

Unscrew *upper transmission plate item 5* complete with motor and pulleys (3 screws).

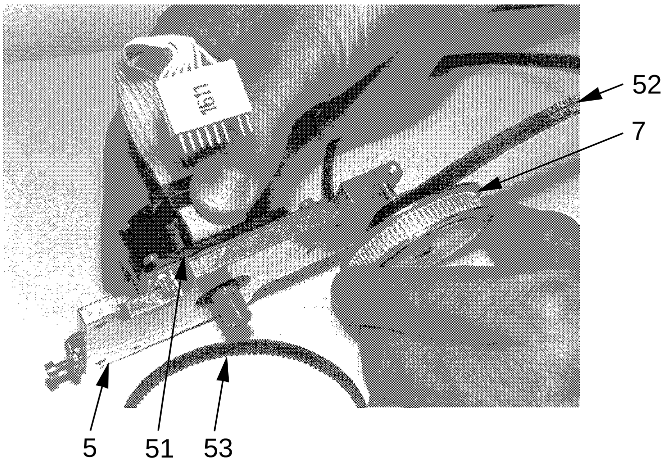


Gear belt item 53

Pull it off motor pulley and replace.

Gear belt item 52

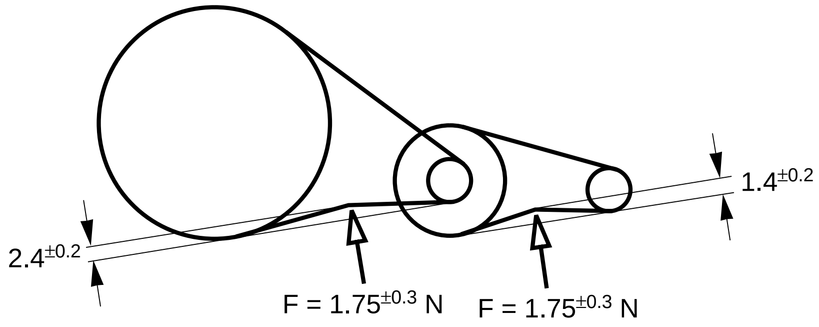
Pull *pulley item 7* off the shaft and replace belt.



Step motor item 51

Unscrew motor from *motor mounting plate item 6* (2 screws) and replace.

Belt tension:

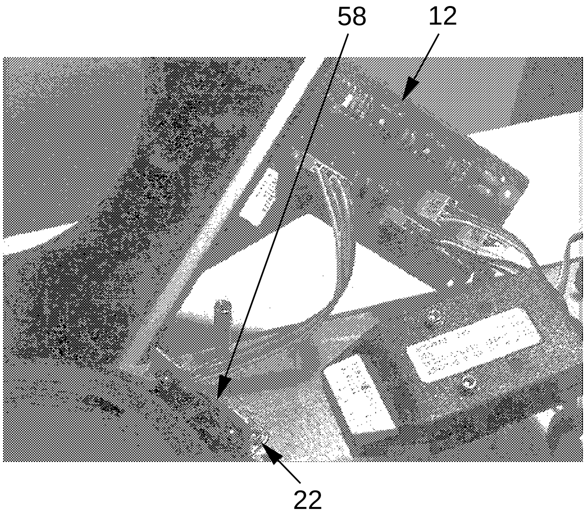

1.4±0.2
2.4±0.2
F = 1.75±0.3 N
F = 1.75±0.3 N

4.4.4.5 Connector board W4 PCB item 58

Remove *connector board W1 item 12* (see section 4.4.4.1).

Disconnect *connector board W4 item 58* on connector board W1.

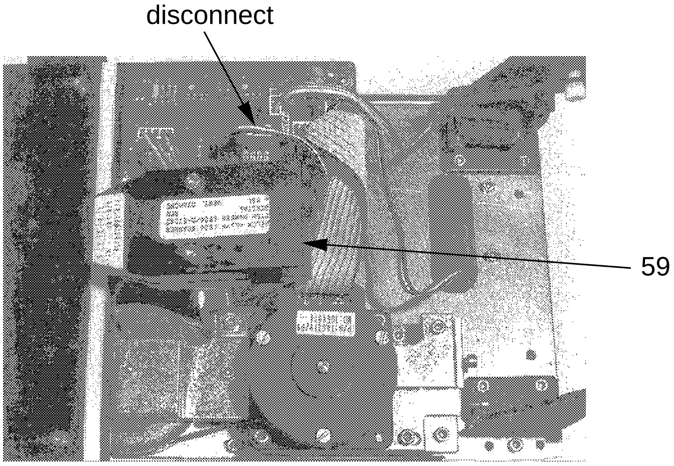
Unscrew *support item 22*, then unscrew connector board W4 from support and replace.



4.4.4.6 Barcode reader BR45 item 59

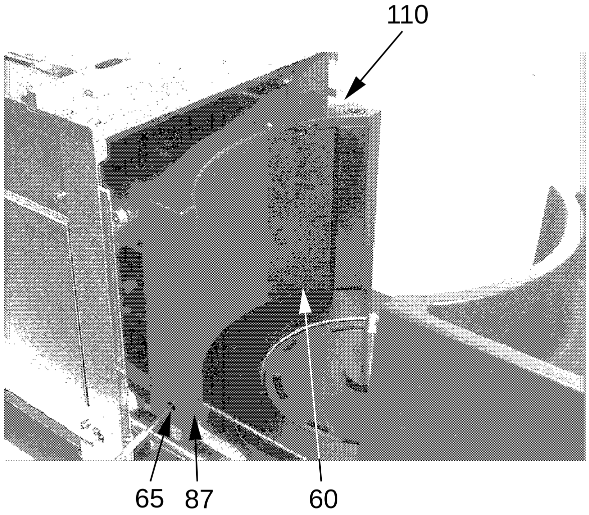
Unscrew and remove *drawer compartment item 81* (see section 4.4.4.11).

Disconnect barcode reader on connector board W1, unscrew and replace.



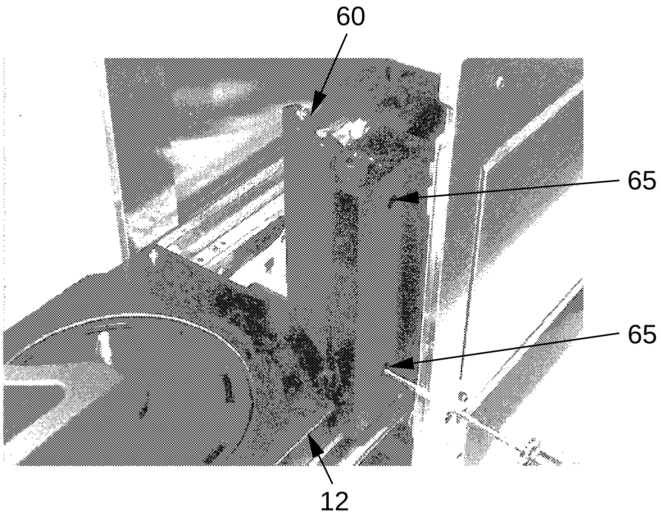
4.4.4.7 Connector board W2 PCB item 60

Open reagent drawer, unscrew *rear shell item 87* (1 screw item 65).



Unscrew and remove *cover item 110* (2 screws).

Unscrew connector board W2, unplug on *connector board W1 item 12* (plug 1620) and replace.



Remounting:

Reconnect plug 1620.

Put the two connector board W2 fixing screws item 65 in place, tighten only slightly.

Install *cover item 110*, tighten the two cover fixing screws only slightly.

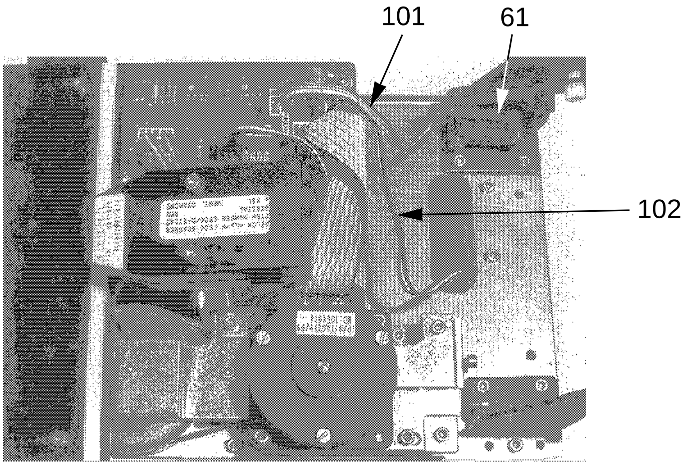
Now tighten the two connector board W2 fixing screws, then the two cover fixing screws.

Install *rear shell item 87*.

4.4.4.8 Hall effect micro switch item 61 drawer access Cable W14 item 101

Unscrew and remove *drawer compartment item 81* (see section 4.4.4.11).

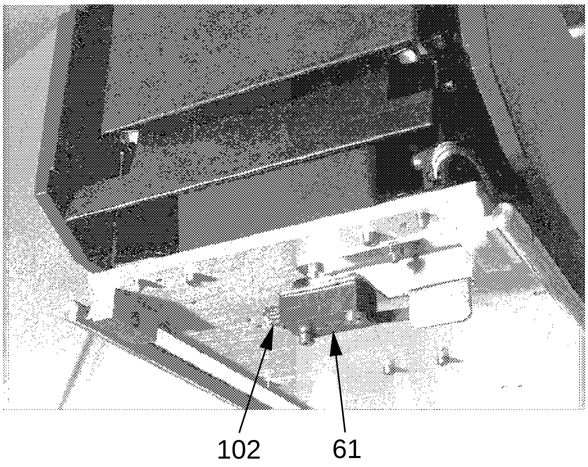
Disconnect / unscrew switch and / or cable and replace.



4.4.4.9 Hall effect micro switch item 61 drawer end position Cable W15 item 102

Unscrew and remove *drawer compartment item 81* (see section 4.4.4.11).

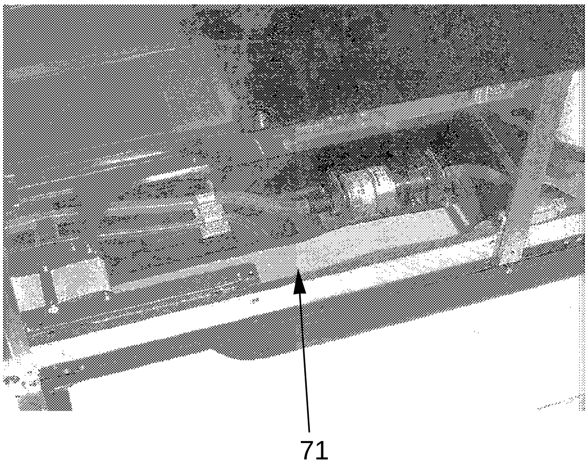
Disconnect / unscrew switch and / or cable and replace.



4.4.4.10 Cable W12 item 71

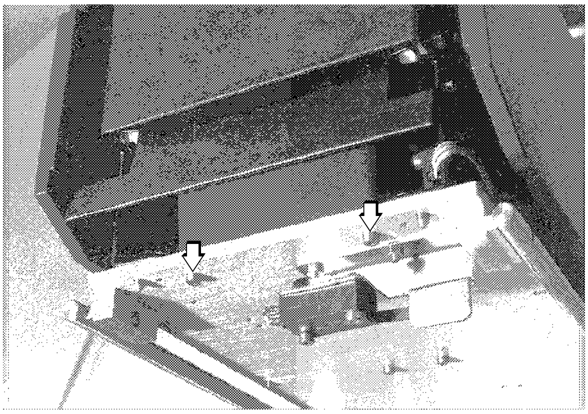
Remove *side cover right item 92* (see section 4.1.4).

Unscrew and replace cable W12.



4.4.4.11 Drawer compartment item 81

Unscrew from underneath the drawer (2 screws) and replace.



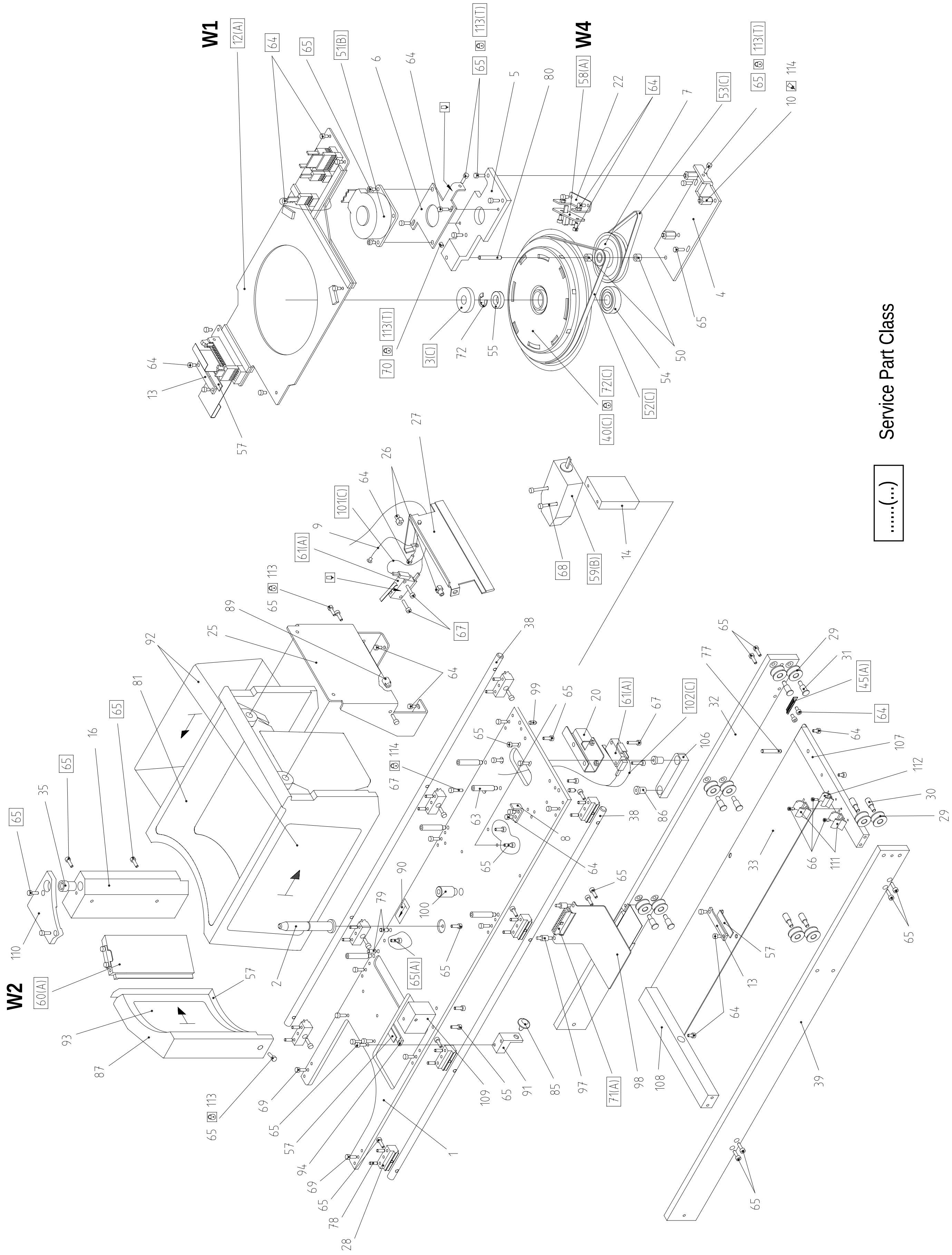
4.4.5 Spare Parts List

REAGENT DRAWER 147251 Revision: 01

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
148348	GRUNDPLATTE	00	1	1.000	
148347	LAGERDORN	00	2	1.000	
147197	ABDECKRING	00	3	1.000	C
147253	PLATTE 1	00	4	1.000	
147226	PLATTE 2	00	5	1.000	
147233	MOTORBLECH	00	6	1.000	
147196	ZAHNRIEMENRAD	00	7	1.000	
147227	ANSCHLAG	00	8	1.000	
146398	CABLE W38	00	9	1.000	
147225	DISTANZBOLZEN	00	10	3.000	
146195	CONNECTORBOARD W1 PCB	02	12	1.000	A
147242	KABELBEFESTIGUNG 1	00	13	2.000	
147235	ABST<TZUNG	00	14	1.000	
147232	STfNDER	00	16	1.000	
147246	SWITCHHALTER	01	20	1.000	
147234	WINKEL	00	22	1.000	
147240	SCHUBLADENWINKEL	00	25	1.000	
147238	SCHARNIERLAGER	00	26	2.000	
147239	SCHARNIERGRIFF	00	27	1.000	
147230	F<HRUNGSHALTERUNG	00	28	8.000	
148345	ROLLE	00	29	10.000	
147217	ROLLENACHSE 1	00	30	4.000	
147218	ROLLENACHSE 2	00	31	6.000	
147231	LfNGSTRfGER RECHTS	00	32	1.000	
147237	ST<TZBLECH	00	33	1.000	
147245	BUNDB<CHSE	00	35	1.000	
147250	F<HRUNGSWELLE	00	38	2.000	
147229	LfNGSTRfGER LINKS	00	39	1.000	
147178	REAGENT CARROUSEL SUPPORT	00	40	1.000	C
148157	KONTAKTFEDER	00	45	1.000	A
253008	SINTERBZ.LAGER 4E7/ 8r7/ 6MM	00	50	2.000	
146319	STEP MOTOR W SE40	00	51	1.000	B
258055	ZAHNRIEMEN MXL Z=256 X 1/ 4”	00	52	1.000	C
258054	ZAHNRIEMEN MXL Z=120 X 1/ 4”	00	53	1.000	C
250026	K.LAGER ID=10 AD=30 B=9	00	54	1.000	
250004	K.LAGER ID=10 AD=19 B= 5	00	55	1.000	
7279355	KLEBBAND 1-SEITIG D= 2 B= 6	00	57	0.450	
146201	CONNECTORBOARD W4 PCB	00	58	1.000	A
146226	BARCODE READER BR45	00	59	1.000	B
146197	CONNECTORBOARD W2 PCB	02	60	1.000	A
370013	SCHALTER MICRO V5J032BB3C	00	61	2.000	A
148156	DISTANZBOLZEN 2	00	63	5.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	64	31.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	65	47.000	
420003	ZYL-SCHR.M 2X 6 DIN912 A2	00	66	3.000	

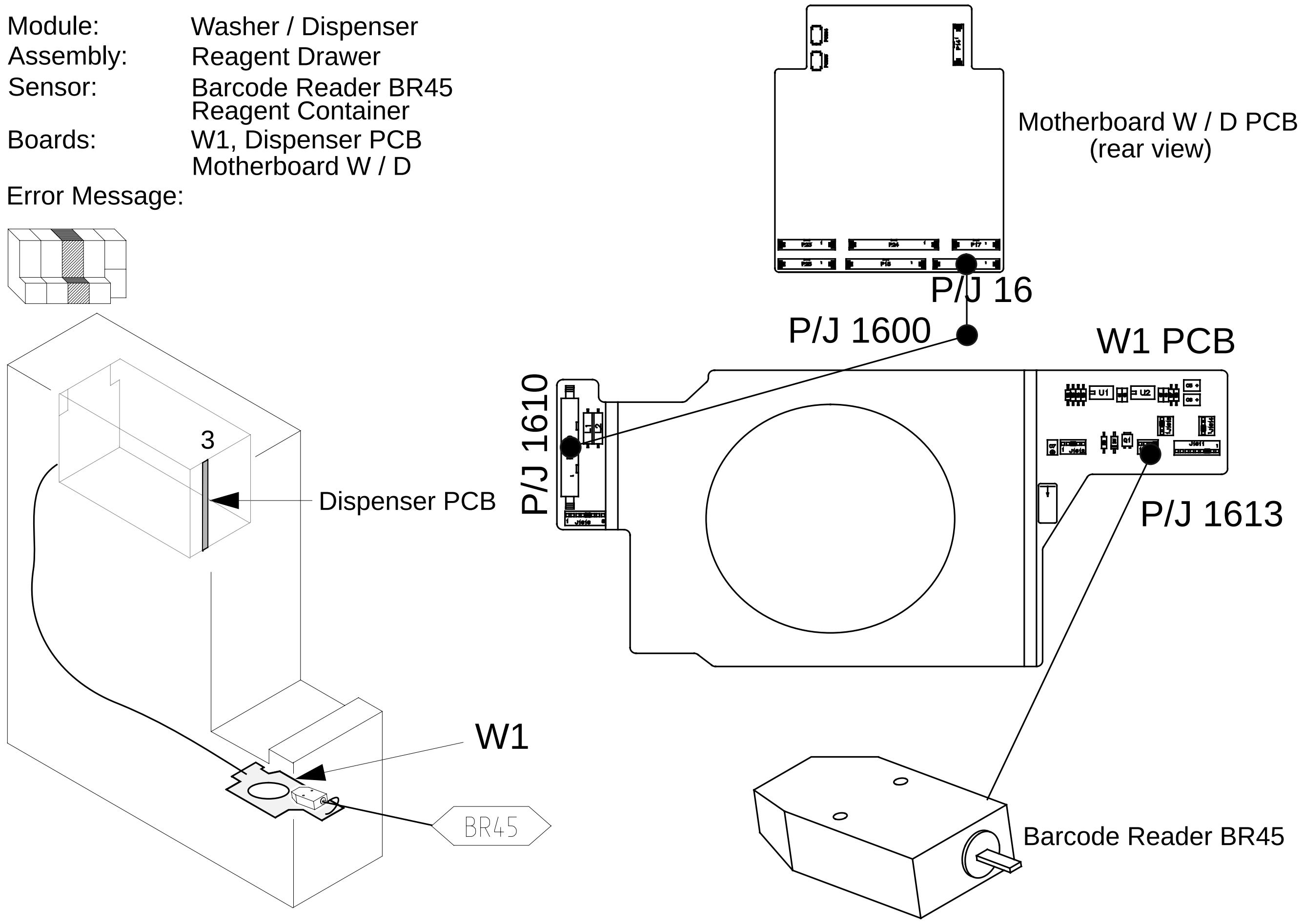
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
420316	ZYL-SCHR.M 3X14 DIN912 A2	00	67	6.000	
400032	ZYL-SCHRAUBE M 4 X25 DIN912	00	68	2.000	
400263	ZYL-SCHR.M 3X 8 DIN912 A2	00	69	8.000	
405462	GEW.STIFT M4 X 5 VERZ DIN916	00	70	1.000	
146222	CABLE W12	00	71	1.000	A
413009	SICHERUNGSSCHEIBE 8 DIN6799	00	72	1.000	
411001	F?CHERSCHEIBE M3 DIN6798	00	73	1.000	
251936	ZYL-STIFT 4x20 VSM 12771B	00	77	1.000	
251093	ZYL-STIFT 3 X10 DIN6325	00	78	16.000	
251932	ZYL.STIFT 4 X10 VSM12771B	00	79	2.000	
251938	ZYL.STIFT 4 X30 VSM12771B	00	80	1.000	
147904	INNENVERSCHALUNG VORNE ROH	00	81	1.000	
279386	DRUCKKNOPFPUFFER NK SCHWARZ	00	85	1.000	
281148	SCHNELLBEFESTIGUNG M3	00	86	2.000	
147902	INNENVERSCHALUNG HINTEN ROH	00	87	1.000	
147908	EXZENTER	00	89	1.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	90	1.000	
147464	WINKEL 2	00	91	1.000	
255627	LABEL CAROUSEL/SCHLAEUCHE	00	92	2.000	
255634	LABEL DRAWER/CONTAINER	00	93	1.000	
147463	KABELBEFESTIGUNG 2	00	94	1.000	
148244	STUETZBOLZEN	00	97	2.000	
147915	F<HRUNGSBLECH	00	98	1.000	
147901	BOLZEN	00	99	2.000	
147907	POSITIONIERB<CHSE	00	100	1.000	
146414	CABLE W14	00	101	1.000	
146415	CABLE W15	00	102	1.000	
148344	BREMSSCHIENE	00	106	1.000	
147991	STREBE 1	00	107	1.000	
147992	STREBE 2	00	108	1.000	
147998	BEFESTIGUNGSKLOTZ 2	00	109	1.000	
147997	DECKEL	00	110	1.000	C
361032	KABELBEF. V-1004	00	111	2.000	
361031	KABELBEF. V-1001	00	112	1.000	
511006	LOCTITE 222 50mL	00	113	0.000	T
511010	LOCTITE 638 50mL	00	114	0.000	T

4.4.6 3D Drawing Reagent Drawer: Dwg 147 251 revision 06

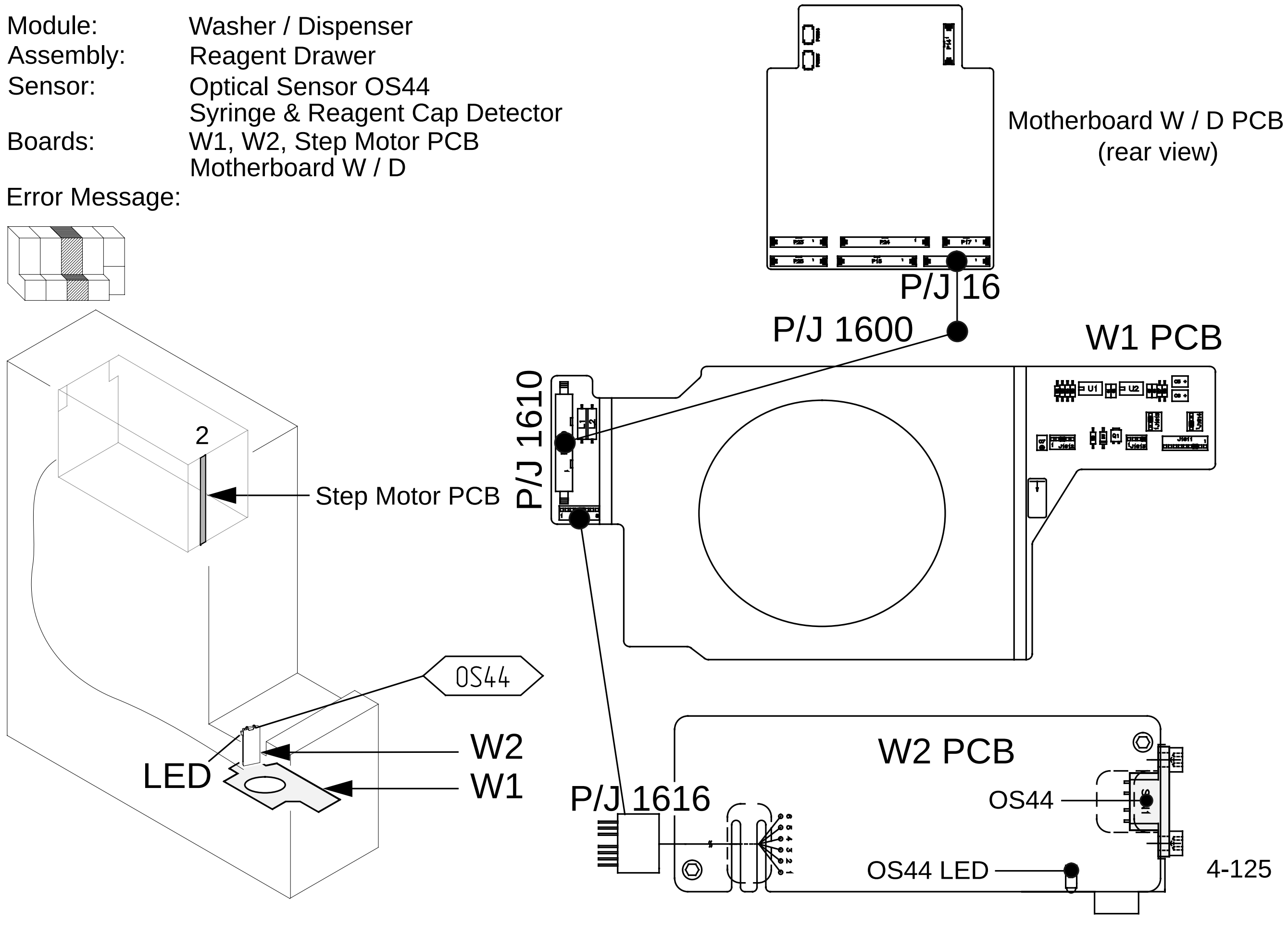

W1
12(A)
64
65
51(B)
6
64
65 113(T)
5
80
W4
58(A)
22
64
7
53(C)
65 113(T)
10 114
4
65
50
54
52(C)
40(C) 72(C)
55
72
3(C)
70 113(T)
64
13
57
27
26
64
101(C)
9
61(A)
65 113
67
68
59(B)
14
38
89
25
64
92
81
65
16
65
35
65
110
W2
60(A)
57
93
87
65 113
2
99
65
20
61(A)
67
102(C)
106
32
77
65
29
31
45(A)
64
64
107
112
30
29
67 114
65
63
38
86
8
65
64
65
33
66
111
90
79
100
65(A)
65
13
57
65
64
109
65
91
85
97
71(A)
98
108
39
69
65
57
94
69
65
78
28
1
65
Service Part Class
.....(...)

4.4.7 Troubleshooting

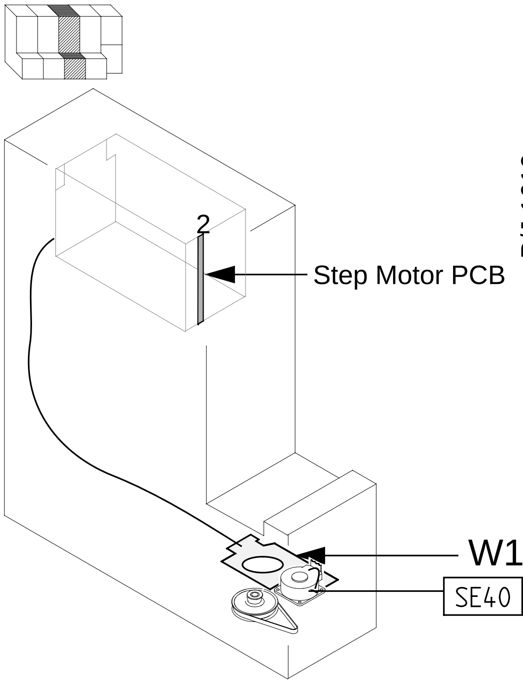
Module:	Washer / Dispenser
Assembly:	Reagent Drawer
Sensor:	Barcode Reader BR45 Reagent Container
Boards:	W1, Dispenser PCB Motherboard W / D
Error Message:	

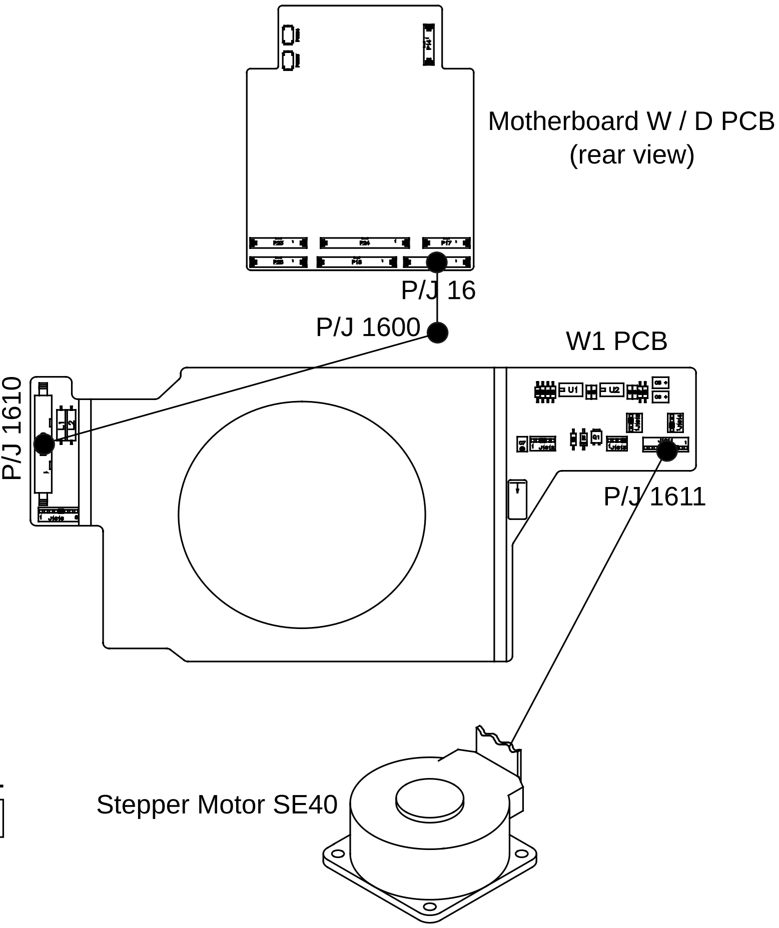

Motherboard W / D PCB
(rear view)
P/J 16
P/J 1600
W1 PCB
P/J 1610
P/J 1613
3
Dispenser PCB
W1
BR45
Barcode Reader BR45

Module:	Washer / Dispenser
Assembly:	Reagent Drawer
Sensor:	Optical Sensor OS44 Syringe & Reagent Cap Detector
Boards:	W1, W2, Step Motor PCB Motherboard W / D
Error Message:	

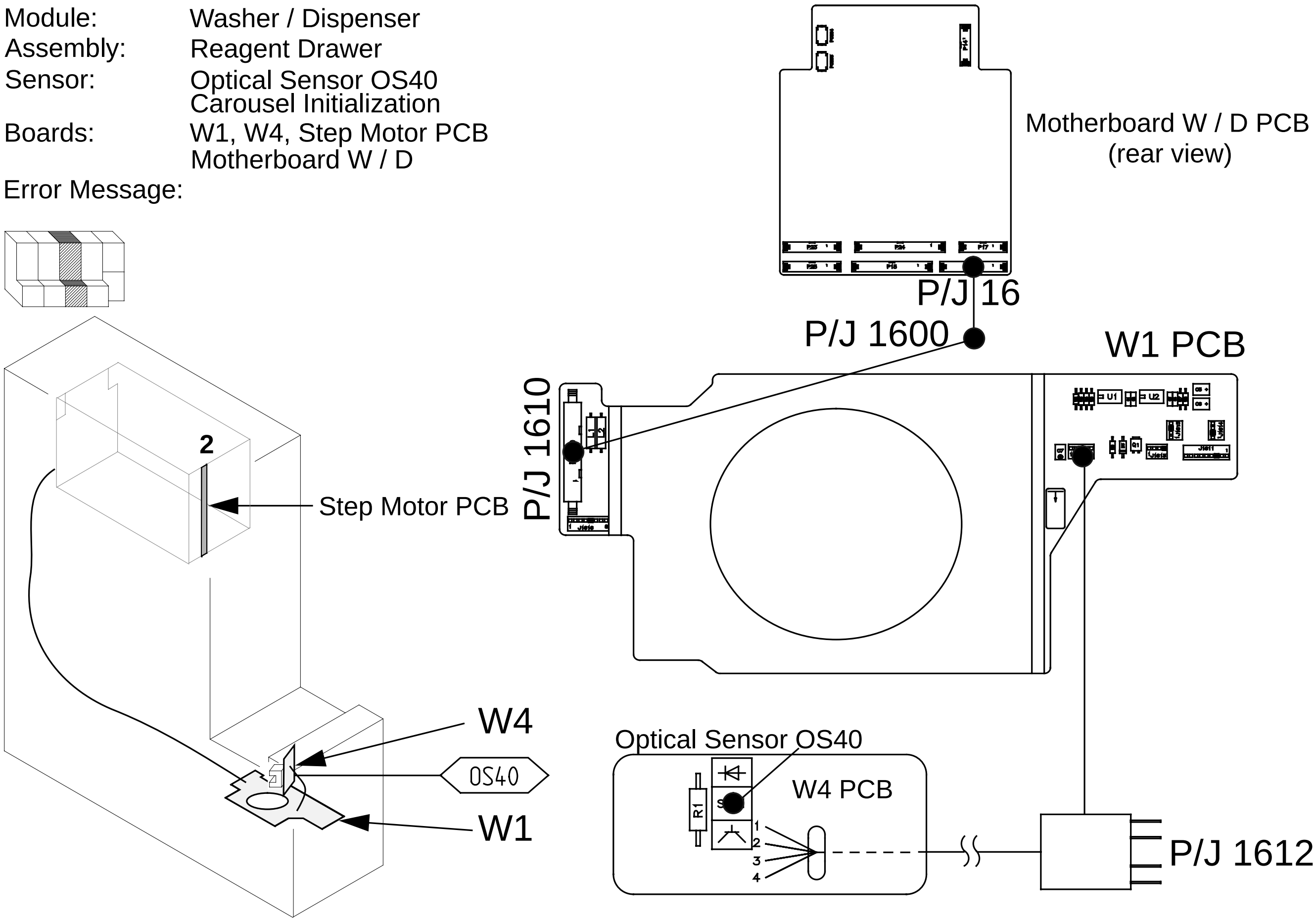

Motherboard W / D PCB
(rear view)
P/J 16
P/J 1600
W1 PCB
P/J 1610
2
Step Motor PCB
OS44
W2
LED
W1
P/J 1616
W2 PCB
OS44
OS44 LED

Module: Washer / Dispenser
Assembly: Reagent Drawer
Actor: Reagent Rotor Drive SE40
Boards: W1, Step Motor PCB
Motherboard W / D
Error Message:

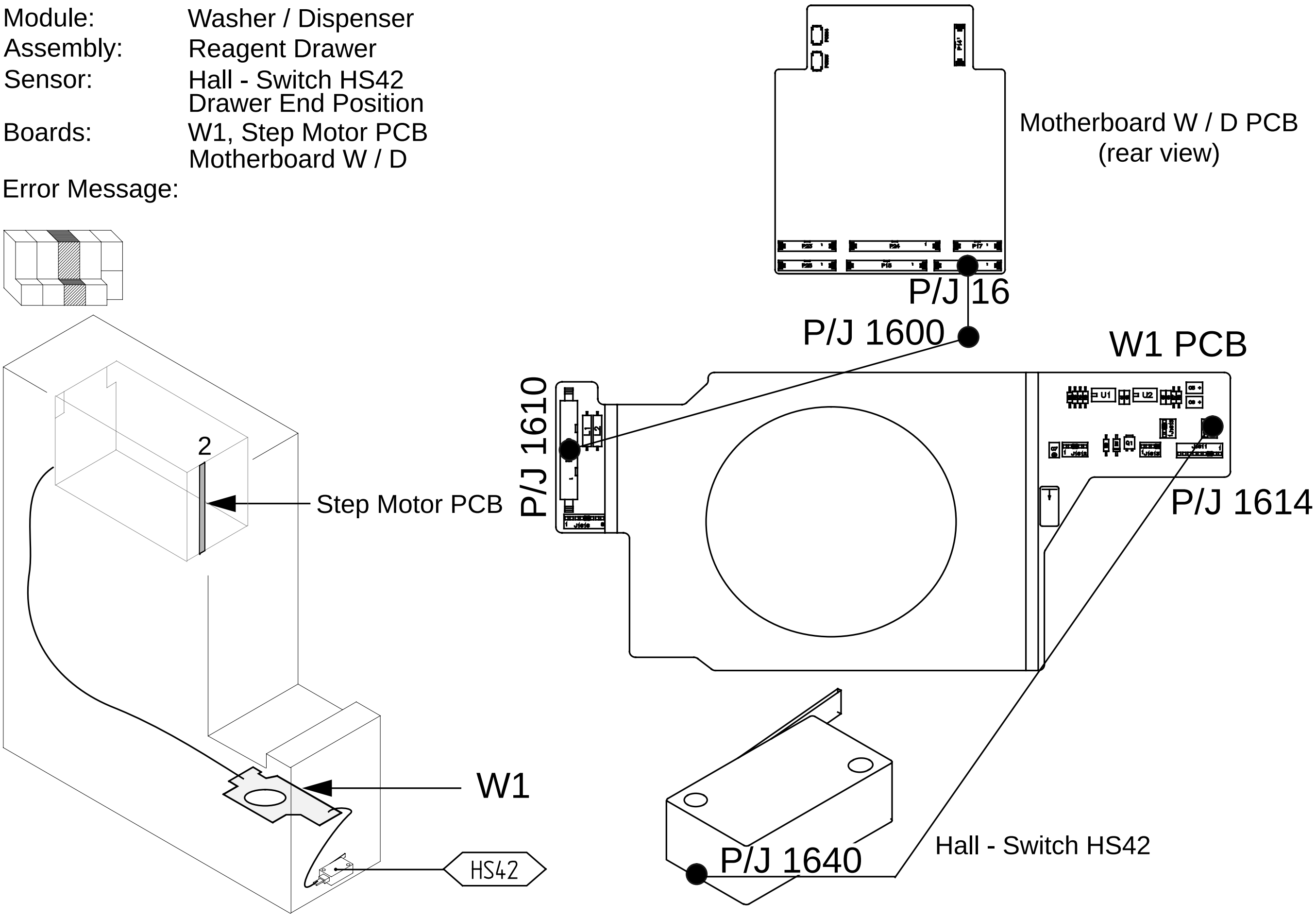

2
Step Motor PCB
W1
SE40


Motherboard W / D PCB
(rear view)
P/J 16
P/J 1600
W1 PCB
P/J 1610
P/J 1611
Stepper Motor SE40

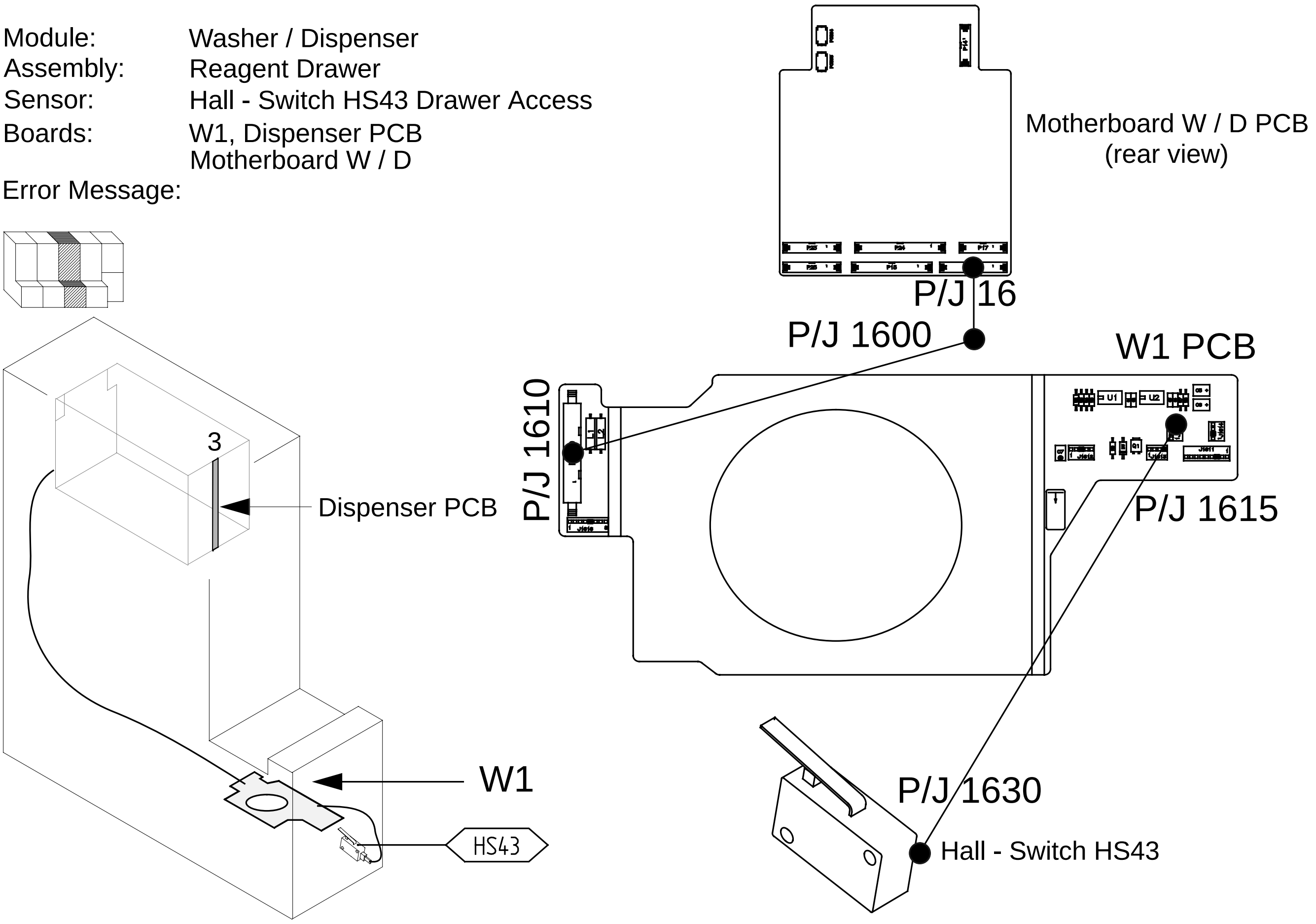
Module: Washer / Dispenser
Assembly: Reagent Drawer
Sensor: Optical Sensor OS40
Carousel Initialization
Boards: W1, W4, Step Motor PCB
Motherboard W / D
Error Message:


Motherboard W / D PCB
(rear view)
P/J 16
P/J 1600
W1 PCB
P/J 1610
2
Step Motor PCB
W4
OS40
W1
Optical Sensor OS40
W4 PCB
R1
S
1
2
3
4
P/J 1612

Module:	Washer / Dispenser
Assembly:	Reagent Drawer
Sensor:	Hall - Switch HS42 Drawer End Position
Boards:	W1, Step Motor PCB Motherboard W / D
Error Message:	


Motherboard W / D PCB
(rear view)
P/J 16
P/J 1600
W1 PCB
P/J 1610
P/J 1614
2
Step Motor PCB
W1
HS42
P/J 1640
Hall - Switch HS42

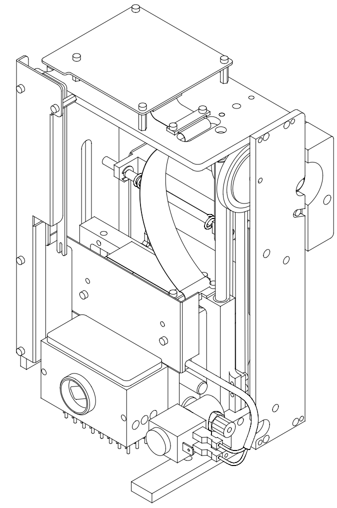
Module:	Washer / Dispenser
Assembly:	Reagent Drawer
Sensor:	Hall - Switch HS43 Drawer Access
Boards:	W1, Dispenser PCB Motherboard W / D
Error Message:	


Motherboard W / D PCB
(rear view)
P/J 16
P/J 1600
W1 PCB
P/J 1610
P/J 1615
3
Dispenser PCB
W1
HS43
P/J 1630
Hall - Switch HS43

Washer Lift

147 733

- Functional Description
- Connector Boards
  - W12 146 232
  - W14 146 236
  - W16 146 278
- Wiring Diagram
- Replacing Spare Parts
- Manifold Complete
  - 147 734
- Spare Parts List
- 3D Drawing
- Troubleshooting

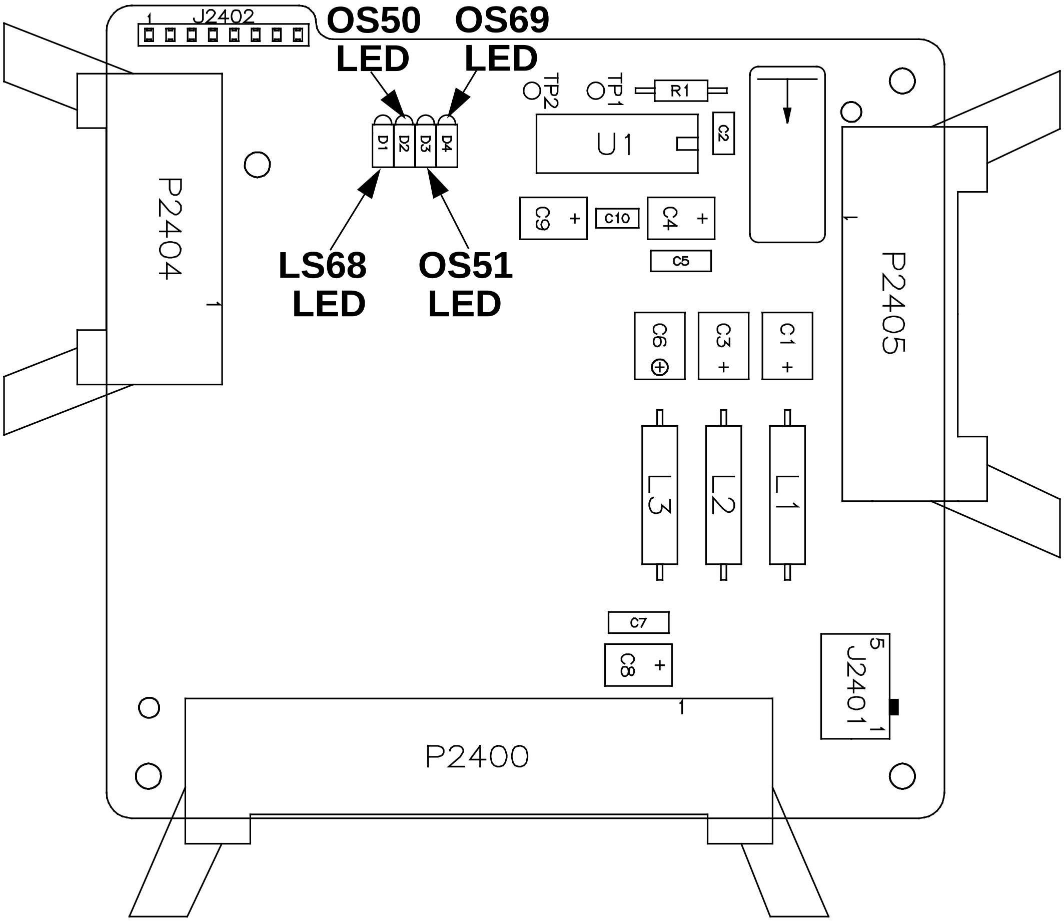


4.5 Washer Lift 147 733

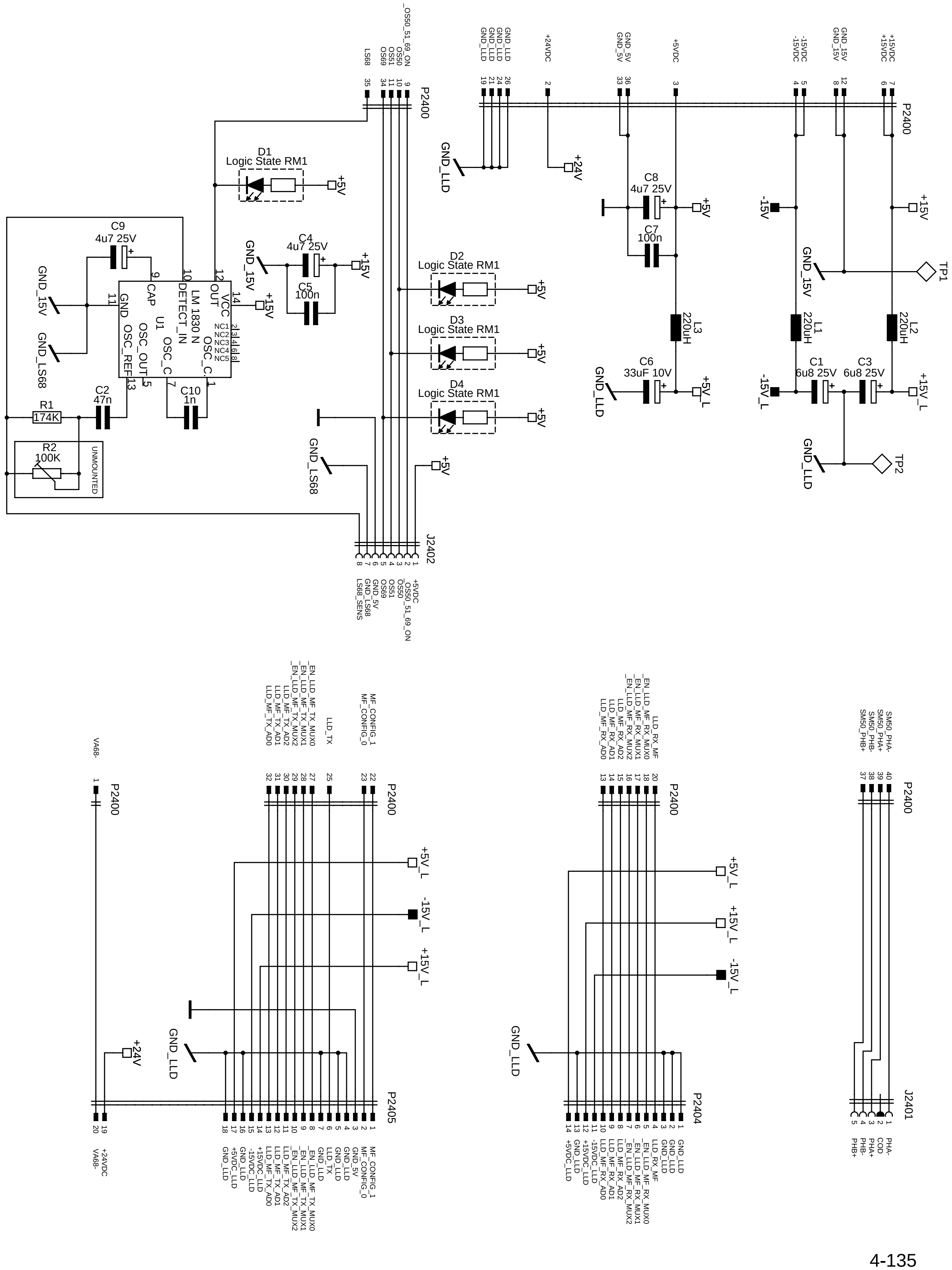
4.5.1 Functional Description

4.5.2 Connector Boards

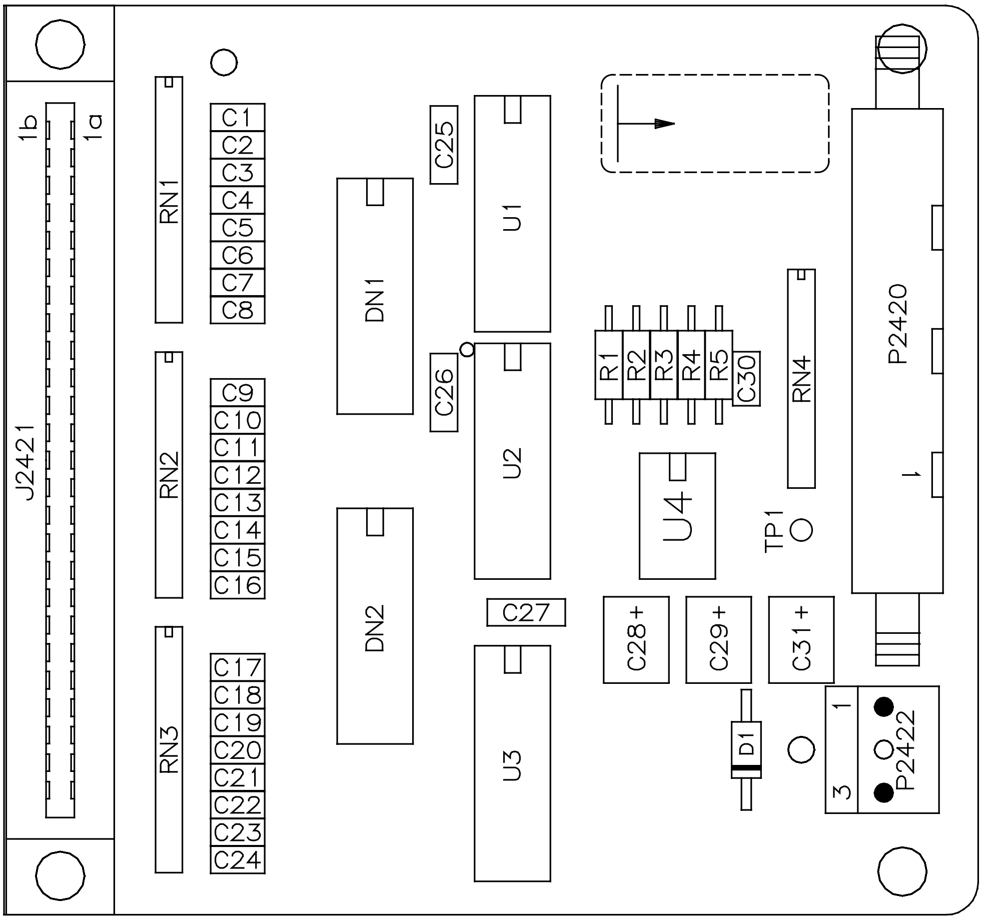
Connector Board W12 PCB Component Layout 146.232 revision 00


J2402
1
OS50
LED
OS69
LED
TP2
TP1
R1
D1
D2
D3
D4
U1
C2
P2404
1
C9
C10
C4
C5
LS68
LED
OS51
LED
C6
C3
C1
P2405
1
L3
L2
L1
C7
C8
5
J2401
1
1
P2400

Connector Board W12 PCB Washer Lift 604.821 revision 00

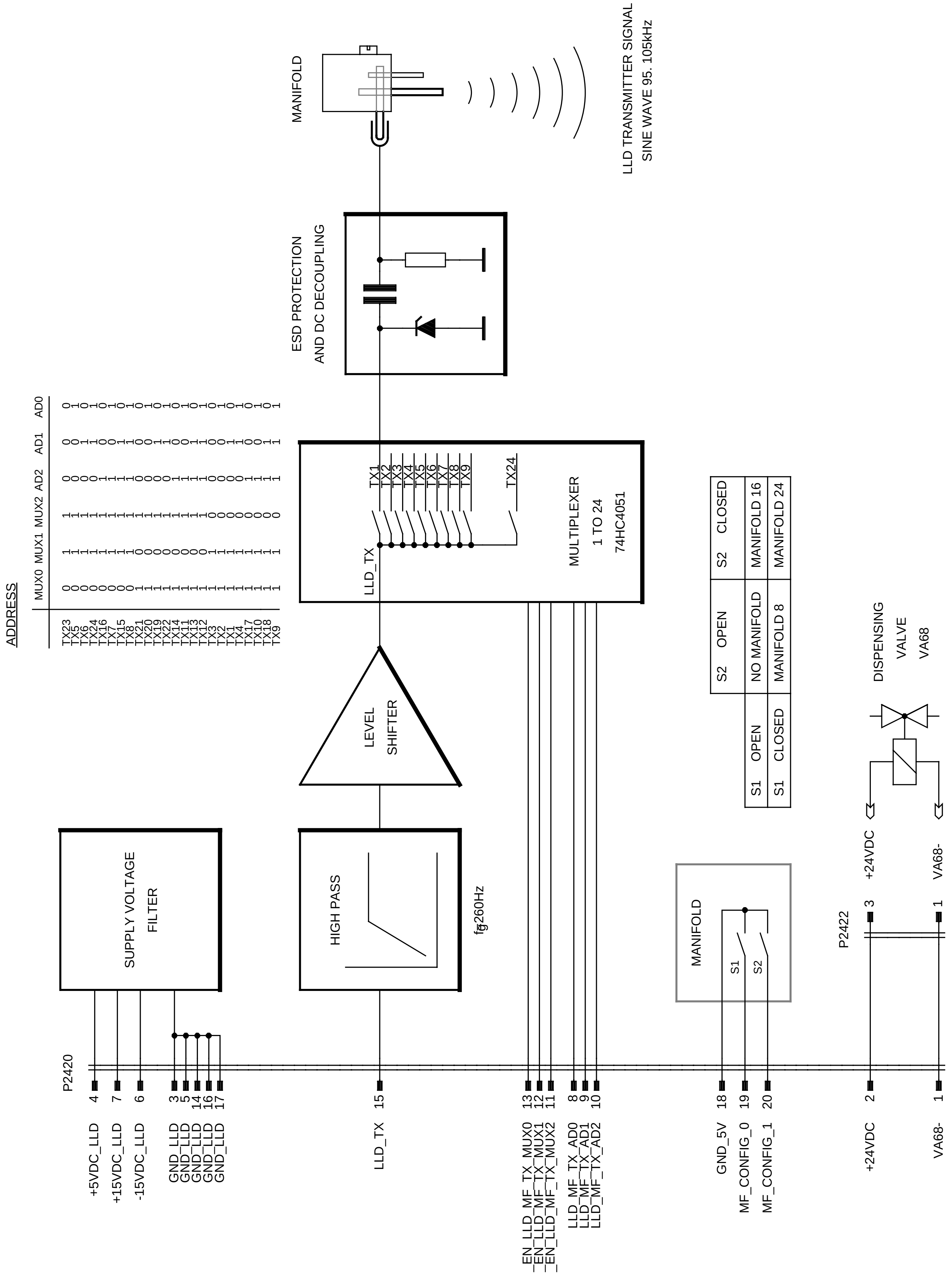

P2400
J2402
P2405
P2404
J2401
D1 Logic State RM1
D2 Logic State RM1
D3 Logic State RM1
D4 Logic State RM1
C9 4u7 25V
C4 4u7 25V
C5 100n
C2 47n
C10 1n
R1 174K
R2 100K
UNMOUNTED
U1 LM 1830 N
VCC
OUT
DETECT_IN
CAP
GND
OSC_REF
OSC_OUT
OSC_C
OSC_C
NC1
NC2
NC3
NC4
NC5
C8 4u7 25V
C7 100n
L3 220uH
C6 33uF 10V
L1 220uH
L2 220uH
C1 6u8 25V
C3 6u8 25V
TP1
TP2
GND_LLD
GND_15V
GND_LS68
+5V
+15V
-15V
+24V
+5V_L
+15V_L
-15V_L
LS68
OS69
OS51
OS50
_OS50_51_69_ON
GND_LLD
+24VDC
GND_5V
+5VDC
-15VDC
GND_15V
+15VDC
+5VDC
_OS50_51_69_ON
OS50
OS51
OS69
GND_5V
GND_LS68
LS68_SENS
VA68-
MF_CONFIG_1
MF_CONFIG_0
LLD_TX
_EN_LLD_MF_TX_MUX0
_EN_LLD_MF_TX_MUX1
_EN_LLD_MF_TX_MUX2
LLD_MF_TX_AD2
LLD_MF_TX_AD1
LLD_MF_TX_AD0
+24VDC
VA68-
GND_5V
GND_LLD
+15VDC_LLD
-15VDC_LLD
+5VDC_LLD
LLD_RX_MF
_EN_LLD_MF_RX_MUX0
_EN_LLD_MF_RX_MUX1
_EN_LLD_MF_RX_MUX2
LLD_MF_RX_AD2
LLD_MF_RX_AD1
LLD_MF_RX_AD0
SM50_PHA-
SM50_PHA+
SM50_PHB-
SM50_PHB+
PHA-
COD
PHA+
PHB-
PHB+

Connector Board W14 PCB Component Layout 146.236 revision 00


1b
1a
J2421
RN1
RN2
RN3
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
C22
C23
C24
C25
C26
C27
DN1
DN2
U1
U2
U3
U4
R1
R2
R3
R4
R5
C30
RN4
P2420
1
TP1
C28+
C29+
C31+
D1
1
3
P2422

Block Diagram Connector Board W14 PCB

Washer LLD Transmitter 614.142 revision 00


MANIFOLD
LLD TRANSMITTER SIGNAL
SINE WAVE 95. 105kHz
ESD PROTECTION
AND DC DECOUPLING
TX1
TX2
TX3
TX4
TX5
TX6
TX7
TX8
TX9
TX24
LLD_TX
MULTIPLEXER
1 TO 24
74HC4051
LEVEL
SHIFTER
HIGH PASS
fg 260Hz
SUPPLY VOLTAGE
FILTER
MANIFOLD
S1
S2
DISPENSING
VALVE
VA68
+24VDC
VA68-
P2422
3
1
P2420
4
7
6
3
5
14
16
17
15
13
12
11
8
9
10
18
19
20
2
1
+5VDC_LLD
+15VDC_LLD
-15VDC_LLD
GND_LLD
GND_LLD
GND_LLD
GND_LLD
GND_LLD
LLD_TX
_EN_LLD_MF_TX_MUX0
_EN_LLD_MF_TX_MUX1
_EN_LLD_MF_TX_MUX2
LLD_MF_TX_AD0
LLD_MF_TX_AD1
LLD_MF_TX_AD2
GND_5V
MF_CONFIG_0
MF_CONFIG_1
+24VDC
VA68-

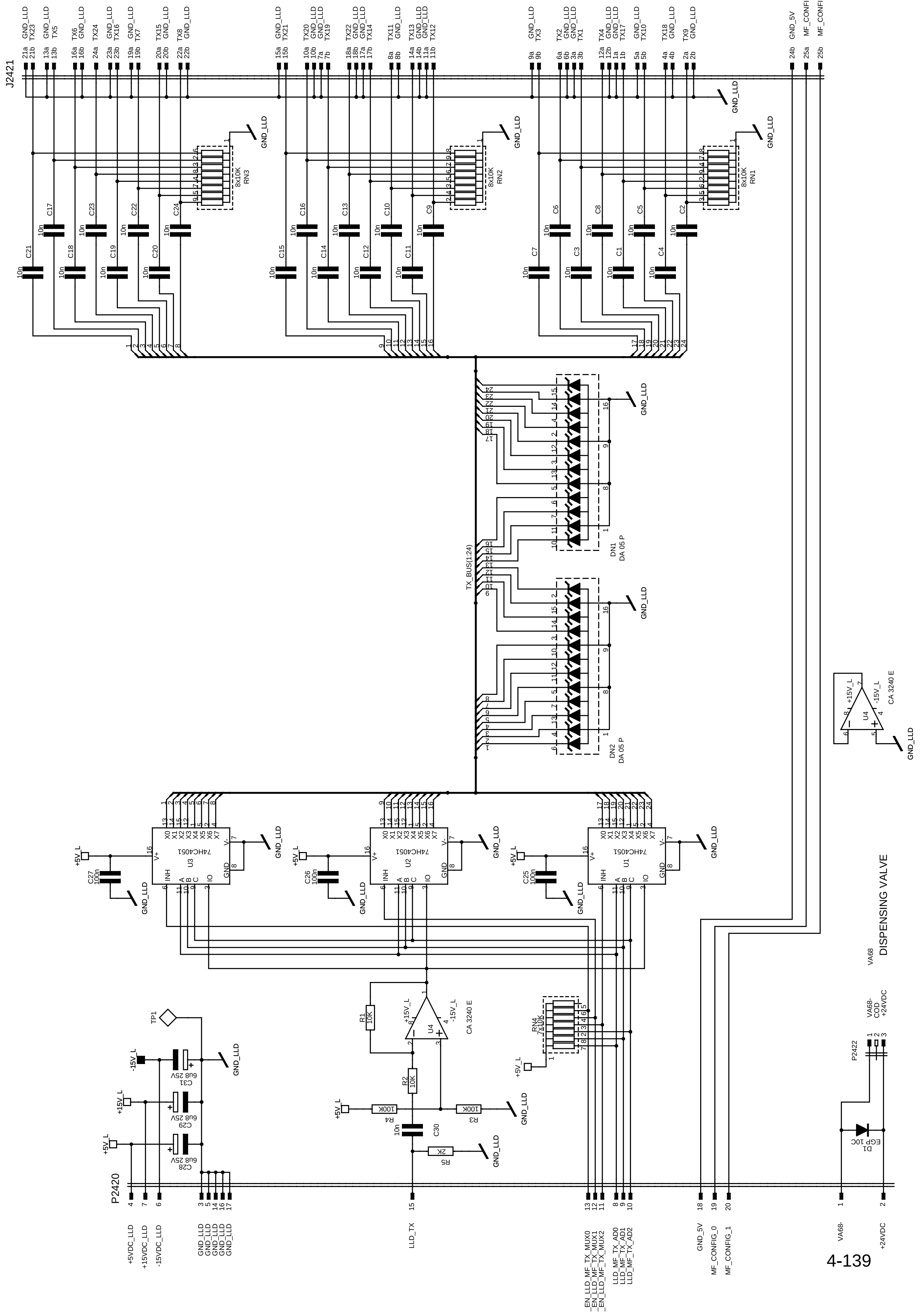
ADDRESS

	MUX0	MUX1	MUX2	AD2	AD1	AD0
TX23	0	1	1	0	0	0
TX5	0	1	1	0	0	1
TX6	0	1	1	0	1	0
TX24	0	1	1	0	1	1
TX16	0	1	1	1	0	0
TX7	0	1	1	1	0	1
TX15	0	1	1	1	1	0
TX8	0	1	1	1	1	1
TX21	1	0	1	0	0	0
TX20	1	0	1	0	0	1
TX19	1	0	1	0	1	0
TX22	1	0	1	0	1	1
TX14	1	0	1	1	0	0
TX11	1	0	1	1	0	1
TX13	1	0	1	1	1	0
TX12	1	0	1	1	1	1
TX3	1	1	0	0	0	0
TX2	1	1	0	0	0	1
TX1	1	1	0	0	1	0
TX4	1	1	0	0	1	1
TX17	1	1	0	1	0	0
TX10	1	1	0	1	0	1
TX18	1	1	0	1	1	0
TX9	1	1	0	1	1	1

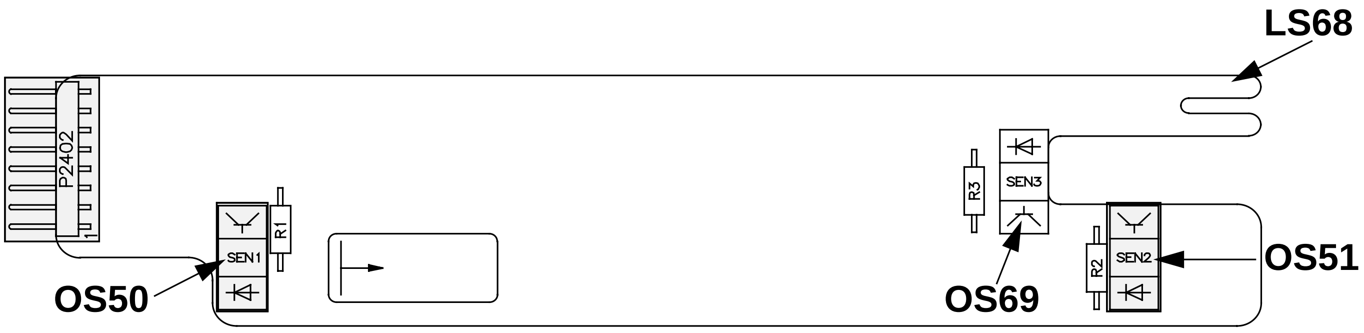
	S2 OPEN	S2 CLOSED
S1 OPEN	NO MANIFOLD	MANIFOLD 16
S1 CLOSED	MANIFOLD 8	MANIFOLD 24

FLEX CABLE TO CONNECTORBOARD W12

Connector Board W14 PCB   Washer LLD Transmitter   604.823   revision 00

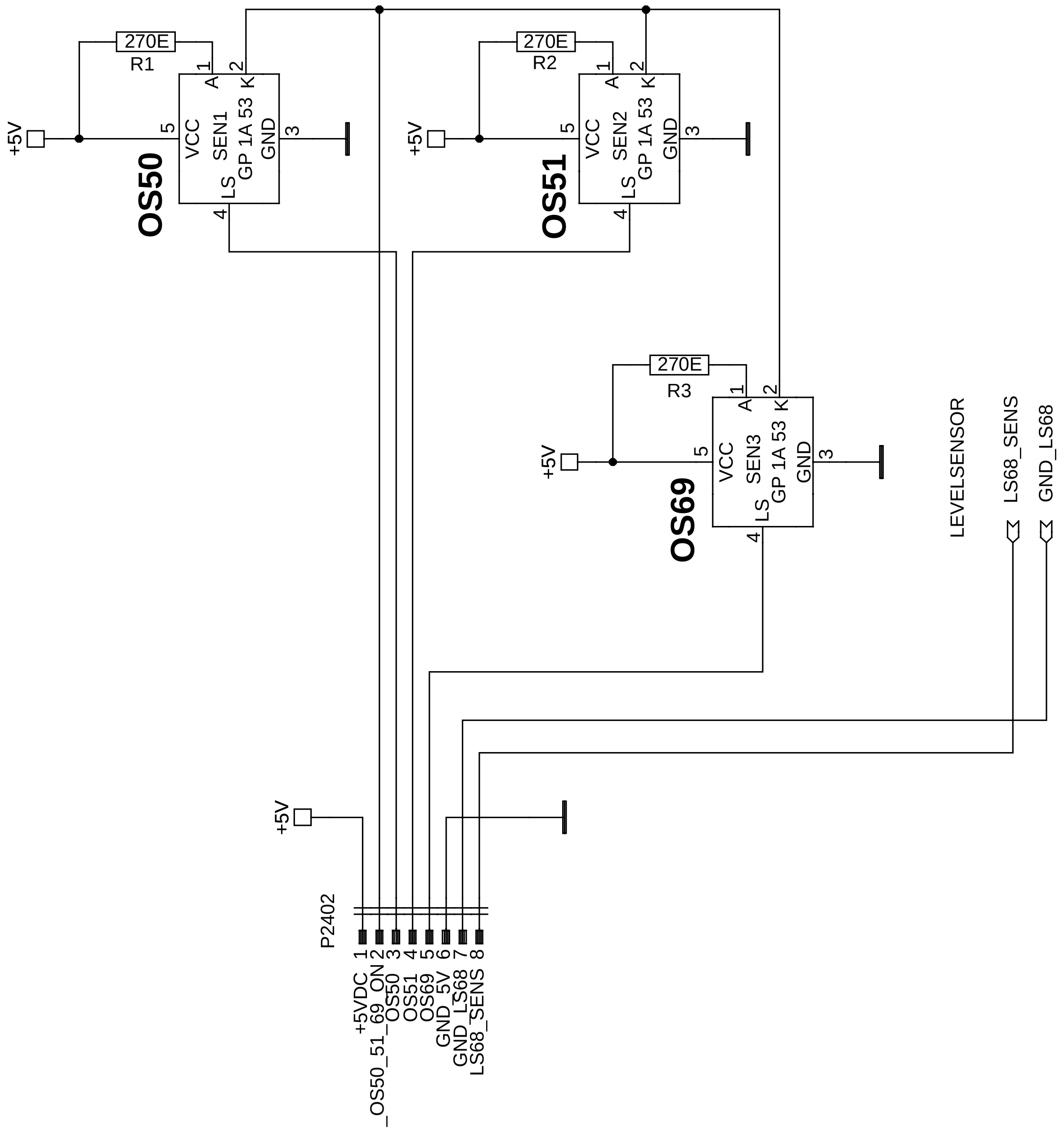

J2421
GND_LLD
TX1
TX2
TX3
TX4
TX5
TX6
TX7
TX8
TX9
TX10
TX11
TX12
TX13
TX14
TX15
TX16
TX17
TX18
TX19
TX20
TX21
TX22
TX23
TX24
GND_5V
MF_CONFIG_0
MF_CONFIG_1
8x10K
RN1
RN2
RN3
RN4
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
C22
C23
C24
10n
TX_BUS(1:24)
DN1
DA 05 P
DN2
DA 05 P
74HC4051
U1
U2
U3
U4
CA 3240 E
+15V_L
-15V_L
+5V_L
C25
C26
C27
100n
R1
10K
R2
10K
R3
100K
R4
100K
R5
2K
C30
TP1
C28
C29
C31
6u8 25V
P2420
+5VDC_LLD
+15VDC_LLD
-15VDC_LLD
LLD_TX
EN_LLD_MF_TX_MUX0
EN_LLD_MF_TX_MUX1
EN_LLD_MF_TX_MUX2
LLD_MF_TX_AD0
LLD_MF_TX_AD1
LLD_MF_TX_AD2
DISPENSING VALVE
VA68
VA68-
VA68-COD
+24VDC
P2422
D1
EGP 10C

Connector Board W16 PCB Component Layout 146.278 revision 00


LS68
P2402
1
R1
SEN1
OS50
R3
SEN3
OS69
R2
SEN2
OS51

Connector Board W16 PCB Wash Shell, Z - Movement OS

604.841 revision 00


270E
R1
1
A
2
K
+5V
5
VCC
SEN1
GP 1A 53
GND
3
LS
4
OS50
270E
R2
1
A
2
K
+5V
5
VCC
SEN2
GP 1A 53
GND
3
LS
4
OS51
270E
R3
1
A
2
K
+5V
5
VCC
SEN3
GP 1A 53
GND
3
LS
4
OS69
LEVELSENSOR
LS68_SENS
GND_LS68
+5V
P2402
+5VDC 1
_OS50_51_69_ON 2
OS50 3
OS51 4
OS69 5
GND_5V 6
GND_LS68 7
LS68_SENS 8

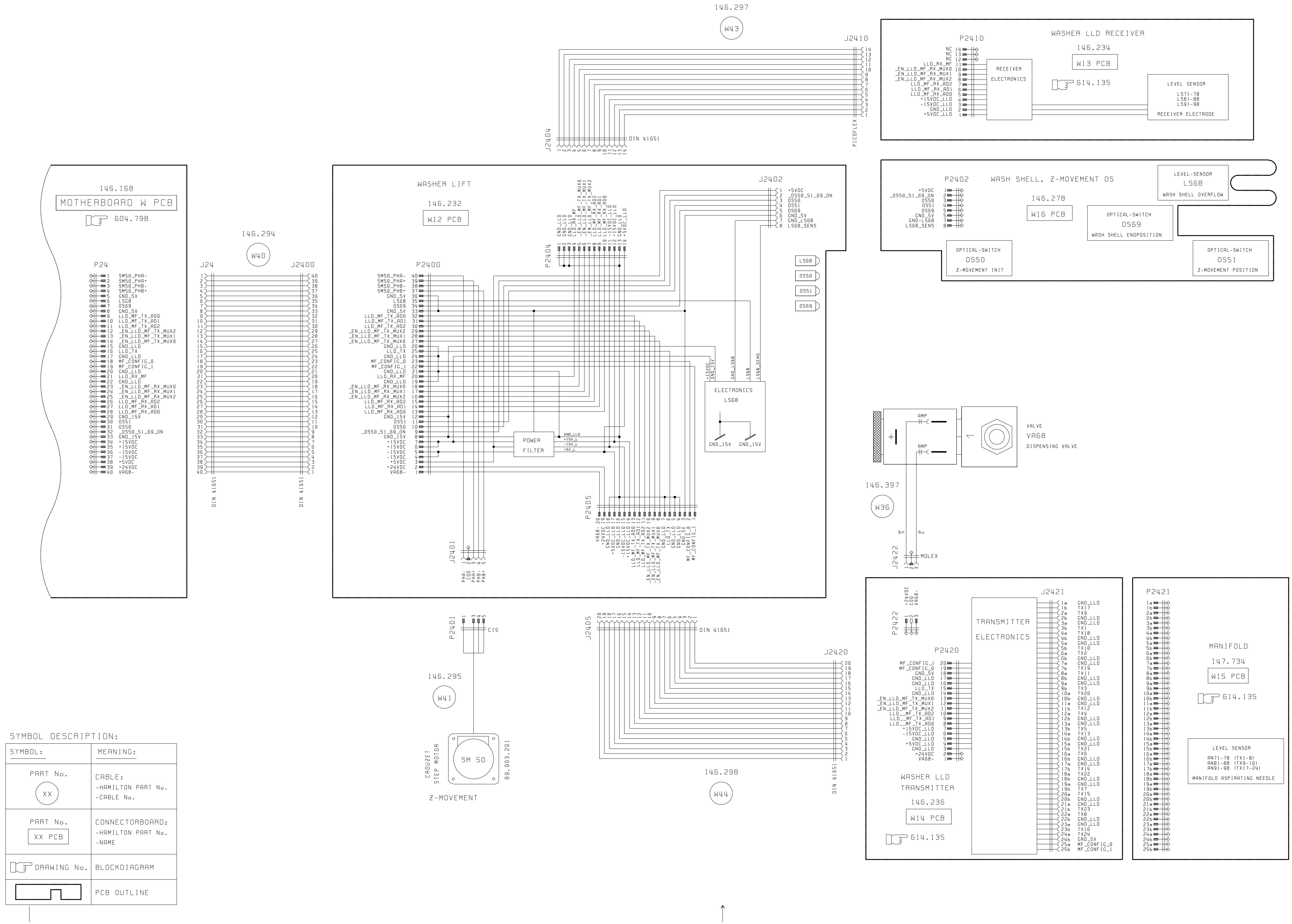
4.5.3 Wiring Diagram

Refer to the drawing on the following page:

❐ Washer Lift: Dwg No. 604 495

Wiring Diagram Washer Lift

604.495 revision 01


146.297
W43
J2410
J2404
DIN 41651
PICOFLEX
WASHER LLD RECEIVER
P2410
146.234
W13 PCB
614.135
RECEIVER ELECTRONICS
LEVEL SENSOR
LS71-78
LS81-88
LS91-98
RECEIVER ELECTRODE
146.168
MOTHERBOARD W PCB
604.798
P24
146.294
W40
J24
J2400
WASHER LIFT
146.232
W12 PCB
P2400
P2404
J2402
POWER FILTER
ELECTRONICS LS68
GND_15V
LS68
OS50
OS51
OS69
P2405
J2401
P2402
WASH SHELL, Z-MOVEMENT OS
146.278
W16 PCB
LEVEL-SENSOR
LS68
WASH SHELL OVERFLOW
OPTICAL-SWITCH
OS69
WASH SHELL ENDPOSITION
OPTICAL-SWITCH
OS50
Z-MOVEMENT INIT
OPTICAL-SWITCH
OS51
Z-MOVEMENT POSITION
AMP
VALVE
VA68
DISPENSING VALVE
146.397
W36
bn
bu
J2422
MOLEX
P2401
CIS
146.295
W41
SM 50
CROUZET STEP MOTOR
89.903.201
Z-MOVEMENT
J2405
DIN 41651
J2420
146.298
W44
P2422
J2421
TRANSMITTER ELECTRONICS
P2420
WASHER LLD TRANSMITTER
146.236
W14 PCB
614.135
P2421
MANIFOLD
147.734
W15 PCB
614.135
LEVEL SENSOR
AN71-78 (TX1-8)
AN81-88 (TX9-16)
AN91-98 (TX17-24)
MANIFOLD ASPIRATING NEEDLE
SYMBOL DESCRIPTION:
SYMBOL:
MEANING:
PART No.
XX
CABLE:
-HAMILTON PART No.
-CABLE No.
PART No.
XX PCB
CONNECTORBOARD:
-HAMILTON PART No.
-NAME
DRAWING No.
BLOCKDIAGRAM
PCB OUTLINE

4.5.4 Replacing spare parts

NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

4.5.4.1 Step motor W SM50 item 2, Gear belts item 48 and 49

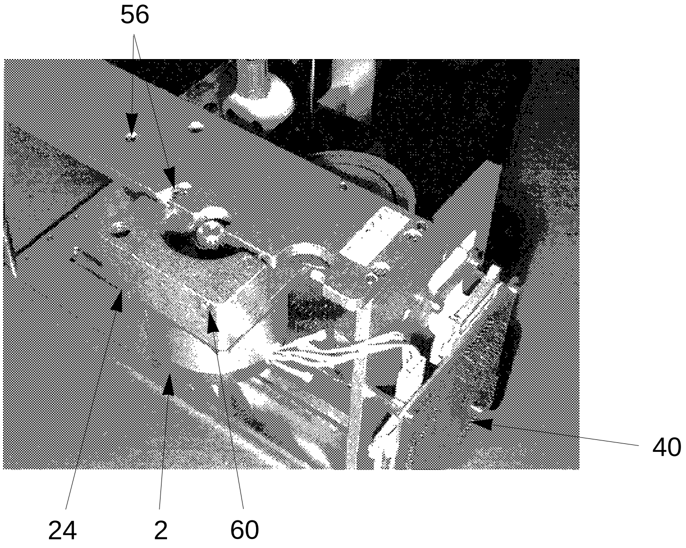
Take the washer lift from the W/D module (see section 4.1.4.3).

Disconnect the step motor on *connector board W12 item 40*.

Slightly loosen the two screws item 56, then loosen *set screw item 60*.

Now unscrew the two screws item 56 and remove *motor support item 24* complete with *step motor item 2*.

Remove step motor from motor support and replace.

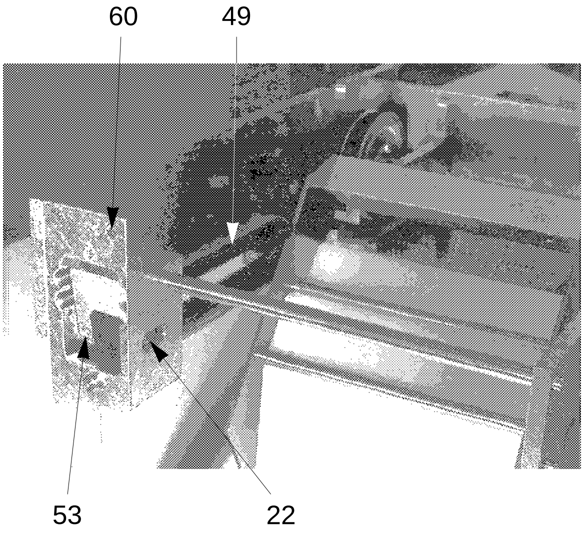


Gear belts:

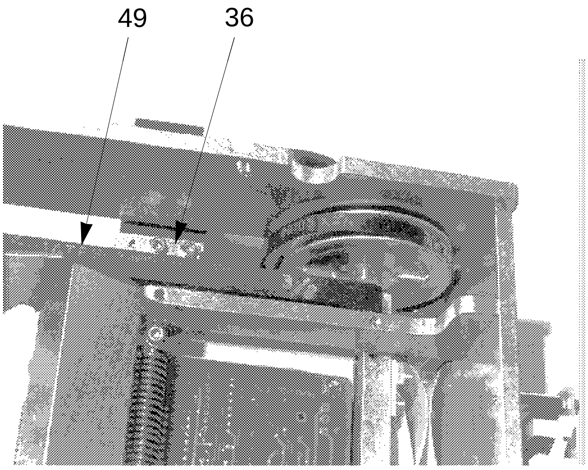
First loosen belt tightening set screw item 60.

Now loosen set screw item 53.

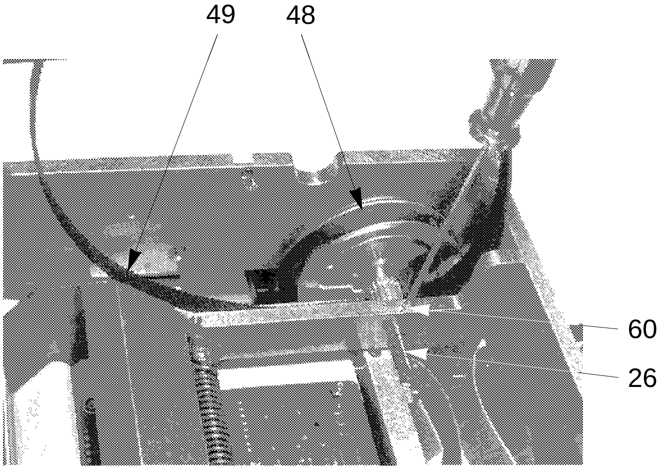
Push out *shaft item 22* to free *gear belt item 49*.



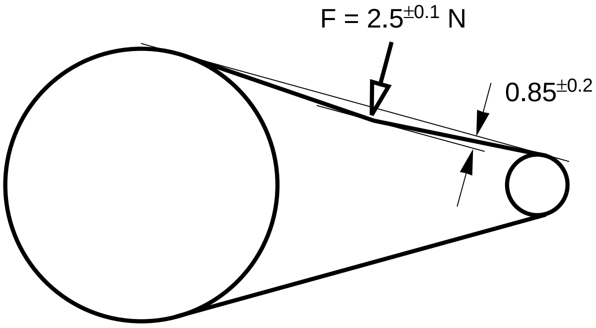
Unscrew and remove *belt clamp item 36*.



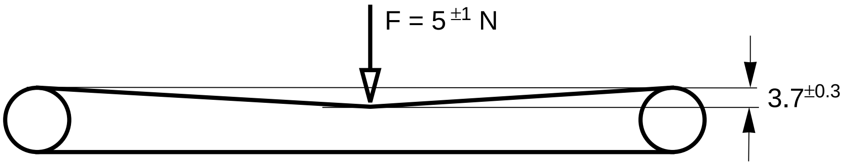
Loosen setscrew item 60, push out *shaft item 26* and replace gear belt(s).



Gear belt item 48 tension:


F = 2.5±0.1 N
0.85±0.2

Gear belt item 49 tension:

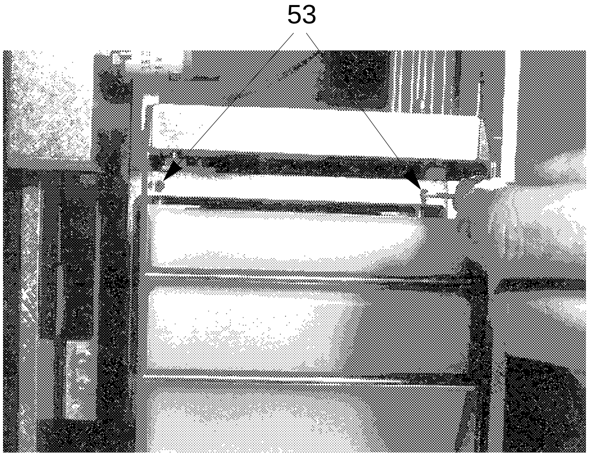


4.5.4.2 Manifold coupling compl. p/n 148 229

Take the washer lift from the W/D module (see section 4.1.4.3).

Position the washer lift approx. 25 mm (1 inch) up from its lowest position to gain access to the two setscrews item 53.

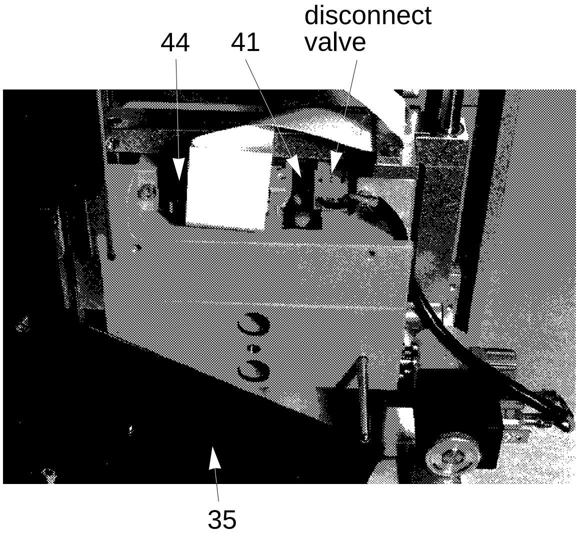
Slacken the two setscrews item 53.



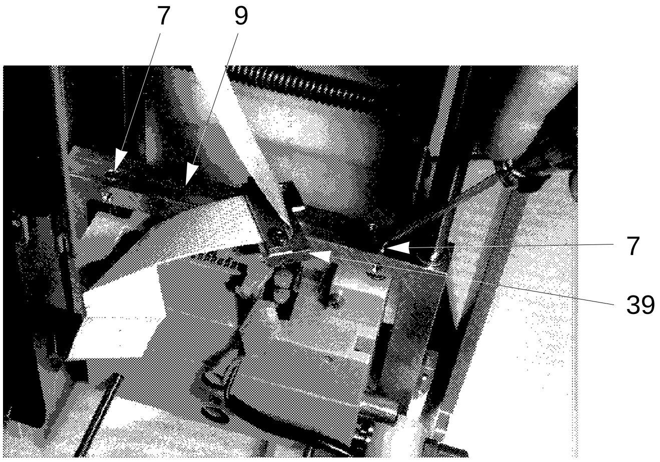
Unscrew and remove *z-lift flag item 35* (2 screws item 57).

Unplug *cable W44 item 44* on *connector board W14 item 41*.

Disconnect *valve item 33* on connector board W14.



Now unscrew *cable support item 39* (1 screw item 57), then push down and pull out the two *positioning pins item 7* and remove manifold coupling compl.



Unscrew *connector board W14 item 41* from manifold coupling compl.

Remounting:

Mount *connector board W14 item 41* on the new manifold coupling, do not tighten the screws.

In order to correctly position the connector board W14, install the (decontaminated!) *manifold compl. item 1* and then tighten the two accessible W14 fixing screws. Remove the manifold compl. and tighten the two remaining screws.

Assemble in reverse order. The two *positioning pins item 7* must be on top flush with *z-support item 9*.

Place the valve cable between *z-lift flag item 35* and the manifold coupling compl. in the provided groove.

Calibration:

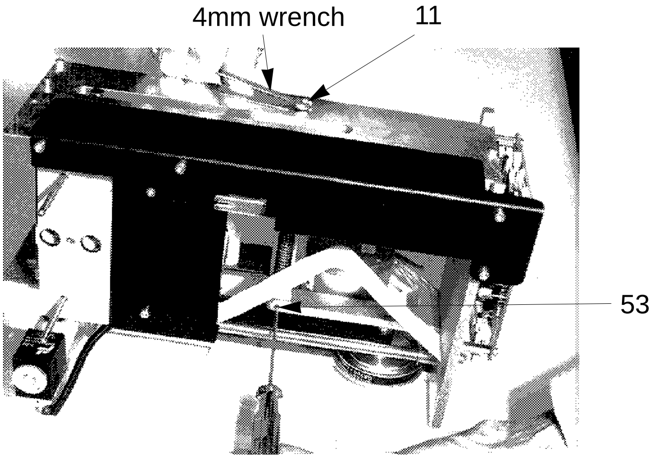
Calibrate z-lift.

4.5.4.3 Shell spring item 12

Take the washer lift from the W/D module (see section 4.1.4.3).

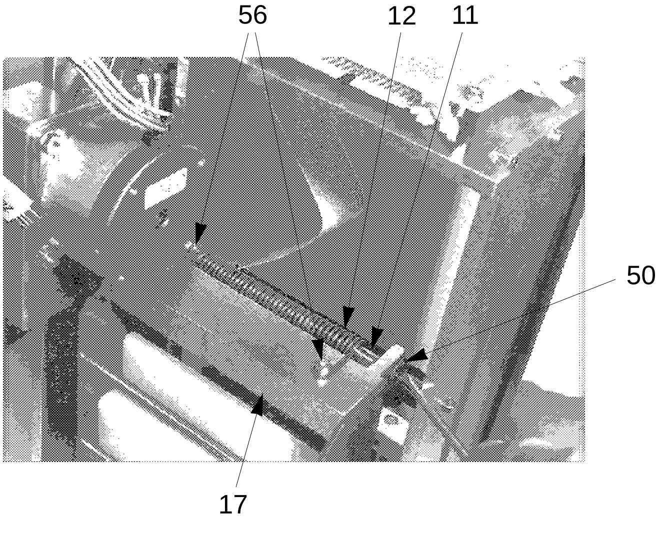
Push the lift all the way to the bottom.

Use a 4mm wrench to hold *shell shaft item 11* (spring tension!) while loosening setscrew item 53.



Slowly release spring tension (approx. 1 full rotation).

Now remove the two retaining rings item 50.



Unscrew *shell spring item 12* (2 screws item 56).

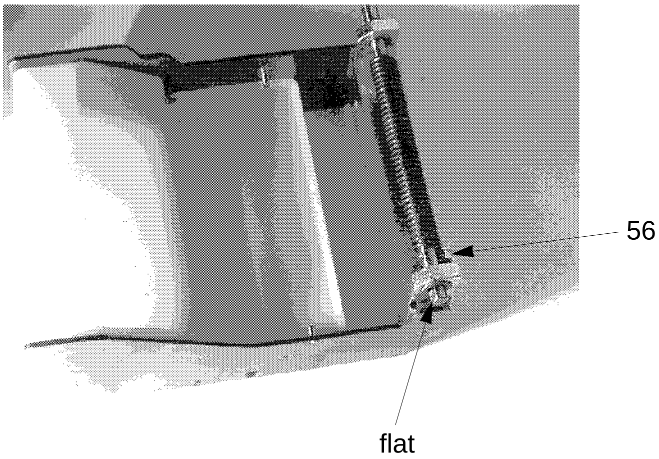
Now push out *shell shaft item 11* and replace shell spring.

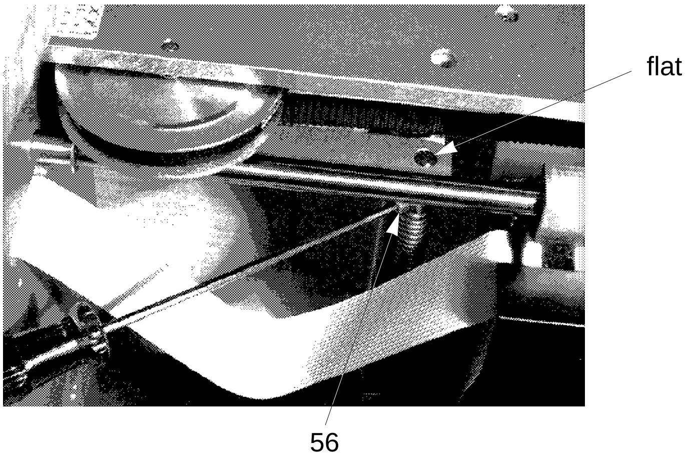
Remounting:

Screw shell spring onto *hinge bracket item 17*.

Put the compl. wash shell in mounting position and fix it by installing *shell shaft item 11* (slide the shell shaft in from motor side of washer lift).

When fixing the shell spring onto the shell shaft make sure to put the screw item 56 ***opposite*** the flat face on shell shaft as shown in the following 2 pictures:





Replace the two retaining rings item 50.

Now, using the 4mm wrench, pretension the shell spring as follows:

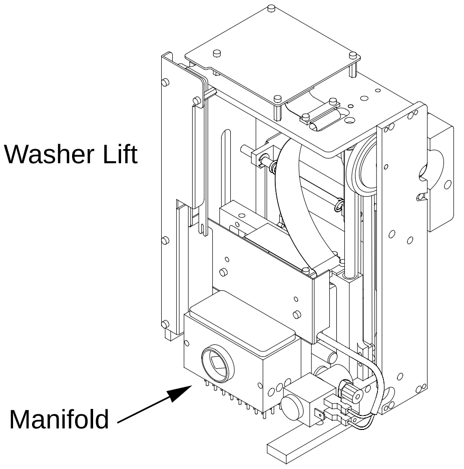
- ❒ turn shell shaft one full turn CCW
- ❒ then continue turning until setscrew item 53 is facing the flat face on *shell shaft item 11*
- ❒ tighten setscrew item 53

4.5.4.4 Wash shell item 13

ATTENTION
This part might be contaminated! Wear gloves! For safety reasons remove manifold item 1 first!

BIOHAZARD
HANDLE WITH CARE
BIOGEFÄHRDUNG

Wear
Gloves



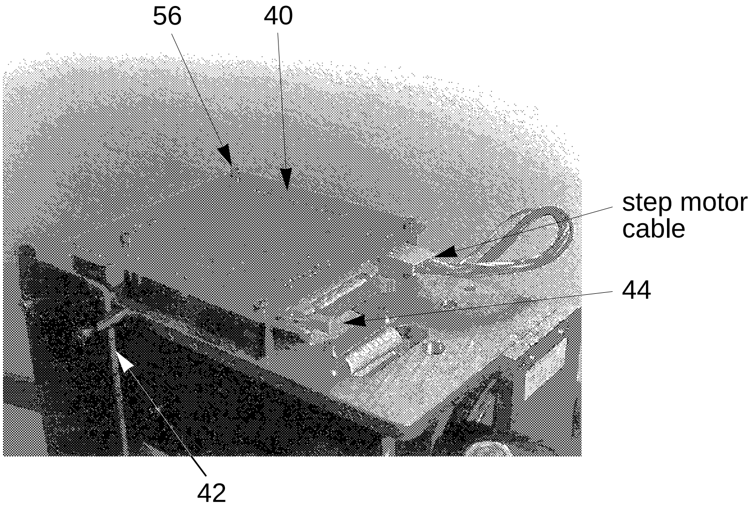
Pull wash shell off its support.

4.5.4.5 Connector board W12 PCB item 40

Take the washer lift from the W/D module (see section 4.1.4.3).

Disconnect *cable W44 item 44* and step motor cable.

Unscrew connector board W12 (4 screws item 56) and then carefully disconnect it from *connector board W16 item 42* and replace.



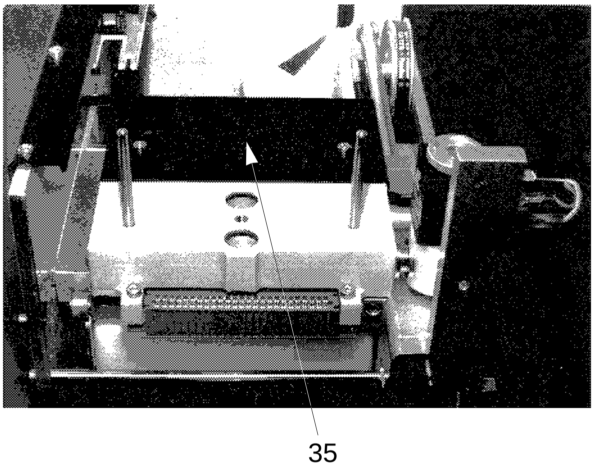
4.5.4.6 Connector board W14 PCB item 41

Take the washer lift from the W/D module (see section 4.1.4.3).

Remove the wash shell.

Push the washer lift to its lowest position.

Unscrew *connector board W14 item 41*. Two of the four screws are accessible through the holes in *z-lift flag item 35* (see the following picture).



Disconnect *cable W44 item 44* and valve cable.

If *z-lift flag item 35* is removed, the z-lift calibration must be carried out. Therefore do not remove the *z-lift flag* in order to gain access to *connector board W14 item 41*.

Remounting:

Connect cable W44 and valve cable on connector board W14.

Mount *connector board W14 item 41* on the manifold coupling, do not tighten the screws.

In order to correctly position the connector board W14, install the (decontaminated!) *manifold compl. item 1* and then tighten the two accessible W14 fixing screws. Remove the manifold compl. and tighten the two remaining screws.

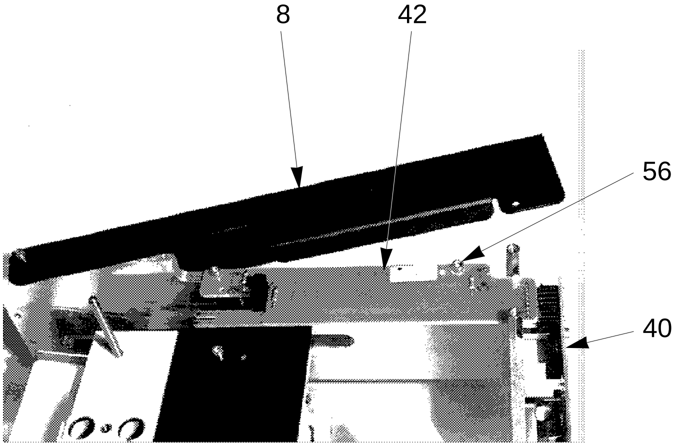
4.5.4.7 Connector board W16 PCB item 42

Remove *hood item 90* (see section 4.1.4).

Push washer lift down to its lowest position.left guard item 8

Unscrew *left guard item 8*.

Unscrew (2 screws item 56) connector board W16 and then carefully disconnect it from *connector board W12 item 40* and replace.



4.5.4.8 Cable W44 item 44

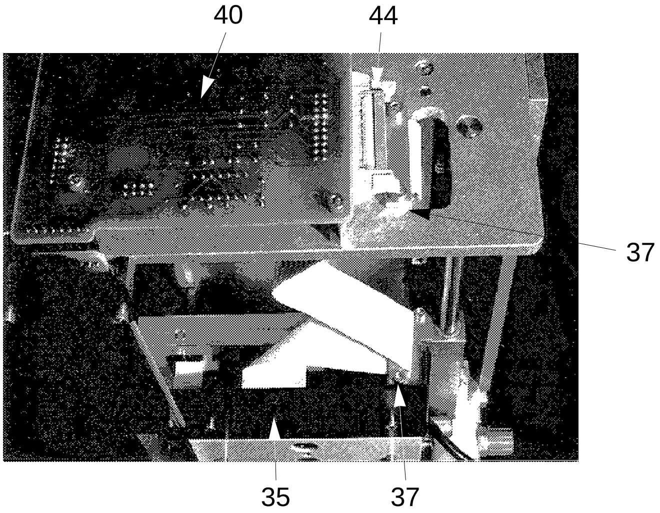
Take the washer lift from the W/D module (see section 4.1.4.3).

Push the washer lift to its lowest position.

Unscrew both *cable clamps item 37*.

Disconnect cable W44 on connector board W12 item 40 and connector board W14 item 41.

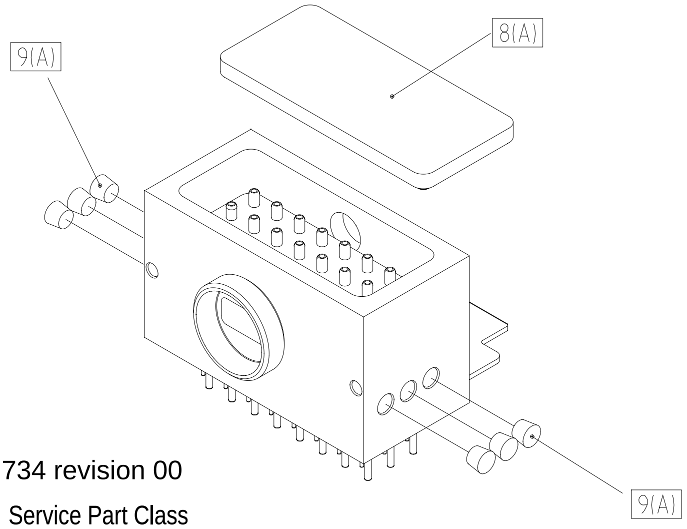
If *z-lift flag item 35* is removed, the z-lift calibration must be carried out. Therefore do not remove the *z-lift flag* in order to gain access to *connector board W14 item 41*.



4.5.5 Manifold Complete

BIOHAZARD
HANDLE WITH CARE
BIOGEFÄHRDUNG

Wear
Gloves



drg. 147 734 revision 00

......(...) Service Part Class

The washer comprises a 24 channel manifold consisting of 3 rows of 8 needles. Each of the 24 wells is washed simultaneously.

An autocalibration of the manifold and a liquid level detection is automatically executed during every cold start of the system.

Each needle is individually liquid level controlled. If a well cannot be properly washed, the liquid level detector produces an error which is documented as a message in the trace file.

Three different wash solutions (up to 3 liters each) and one rinsing fluid (up to 3 liters) can be loaded into the wash container stack situated next to the End Module. All wash containers are liquid level controlled. All wash functions and liquid definitions are programmable by the software in the Method Definition window. For example:

❐ Wash mode
❐ Wash cycles
❐ Soak time
❐ Volume
❐ Solution name

Rinsing

An intelligent cleansing procedure is built into the system. If the washer is not used for a user predefined time or when it is switched from one wash solution to another, the system is automatically rinsed.

Waste Container

The waste container has a capacity of 10 liters. There is also a liquid level detector in the lid of the container. When it is full, you will be notified by a message on the computer screen. Emptying of the waste container during operation is possible.

4.5.6 Spare Parts List

WASHER LIFT 147733 Revision: 00

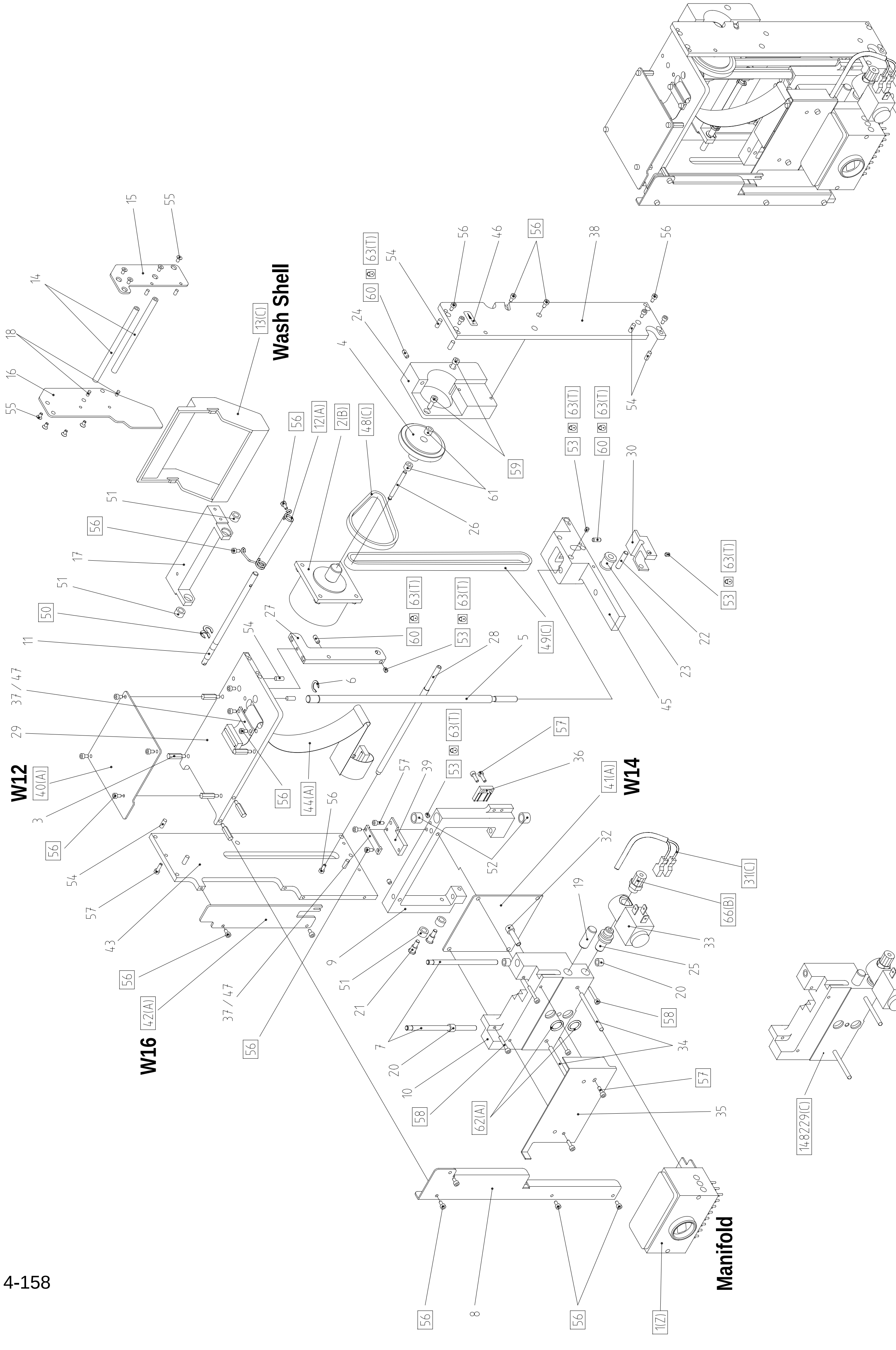
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147734	MANIFOLD COMPL.	01	1	1.000	Z
146295	STEP MOTOR W SM50	00	2	1.000	B
257039	DISTANZHALTER M3X16 I/A GEW.	00	3	6.000	
147709	DOPPEL-ZAHNRIEMENRAD	00	4	1.000	
147722	Z-STANGE	00	5	1.000	
413007	SICHERUNGSSCHEIBE 6 DIN6799	00	6	1.000	C
147688	POSITIONIER-STANGE	00	7	2.000	
148174	ABDECKUNG LINKS	00	8	1.000	
147699	Z-TRAEGER	00	9	1.000	
147730	KUPPLUNG	00	10	1.000	
147719	SHELL-WELLE	00	11	1.000	
147720	SHELL-FEDER	00	12	1.000	A
147731	WASHSHELL	00	13	1.000	C
147717	DISTANZSTUECK-SHELL	00	14	2.000	
147716	SHELL-WAND-RECHTS	00	15	1.000	
148184	SHELL-WAND-LINKS	00	16	1.000	
147718	SHELL-STREBE	00	17	1.000	
251920	ZYL-STIFT 3 X 6 VSM12771B	00	18	4.000	
148321	VERBINDUNGSROHR	00	19	1.000	
147696	GLEITLAGER 5/8x6 SINTERBRONCE	00	20	3.000	
147705	HALTESTIFT	00	21	2.000	
147712	WELLE ZU UMLENKROLLE	00	22	1.000	
147711	UMLENKROLLE	00	23	1.000	
148177	MOTORTRAEGER	00	24	1.000	
148310	VERBINDUNGSSTUECK	00	25	1.000	
148172	WELLE ZU DOPPEL-ZAHNRIEMENRAD	00	26	1.000	
148171	MITTELSTUETZE	00	27	1.000	
148170	DISTANZBOLZEN	00	28	1.000	
148176	DECKPLATTE	00	29	1.000	
148227	RIEMENSPANNBUEGEL	00	30	1.000	
146397	CABLE W36	00	31	1.000	C
147914	GEWINDEBUECHSE M4	00	32	1.000	
394012	M.VENT. 2/2 WEG PVDF 24V 5W	01	33	1.000	
147694	POSITIONIERBOLZEN	00	34	2.000	
147706	FAHNE Z-HUB	00	35	1.000	
147707	RIEMENKLEMME MINIPITCH	00	36	1.000	
147715	KABELBEFESTIGUNG FLACHLEITER	00	37	2.000	
148175	SEITENPLATTE RECHTS	00	38	1.000	
147702	KLEMMBUEGEL	00	39	1.000	
146232	CONNECTORBOARD W12 PCB	00	40	1.000	A
146236	CONNECTORBOARD W14 PCB	00	41	1.000	A
146278	CONNECTORBOARD W16 PCB	01	42	1.000	A
148173	SEITENPLATTE LINKS	00	43	1.000	
146298	CABLE W44	00	44	1.000	A
148169	BODENPLATTE	00	45	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
255037	KENNZEICHNUNGS LABEL 30 X 12	00	46	1.000	
7279355	KLEBBAND 1-SEITIG D= 2 B= 6	00	47	0.050	
258063	ZAHNRIEMEN Z=105 X 1/4”	00	48	1.000	C
258062	ZAHNRIEMEN Z=235 X 3/8”	00	49	1.000	C
413026	SICHERUNGSSCHEIBE ROSTFREI 5,0	00	50	2.000	
253014	SINTERBZ.LAGER 6E7/10r7/ 6MM	00	51	4.000	
279365	SINTERBZ.LAGER 8E7/11R7/ 8 MM	00	52	2.000	
405462	GEW.STIFT M4 X 5 VERZ DIN916	00	53	6.000	
251932	ZYL.STIFT 4 X10 VSM12771B	00	54	9.000	
403452	SENKSCHRAUBE M 3X 6 DIN7991	00	55	8.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	56	24.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	57	6.000	
420314	ZYL-SCHR.M 3X20 DIN912 A2	00	58	4.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	59	2.000	
405225	GEW.STIFT M 4X10 VERZ DIN914	00	60	2.000	
253008	SINTERBZ.LAGER 4E7/ 8r7/ 6MM	00	61	2.000	
254106	O-RING 12.00X2.00 VITON	00	62	2.000	A
511006	LOCTITE 222 50mL	00	63	0.000	T
279551	VERSCHRAUBUNG D= 4 G 1/8	00	66	1.000	A

Service Assemblies (parts list 146999)

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
148229	Manifold coupling complete	00		1	C

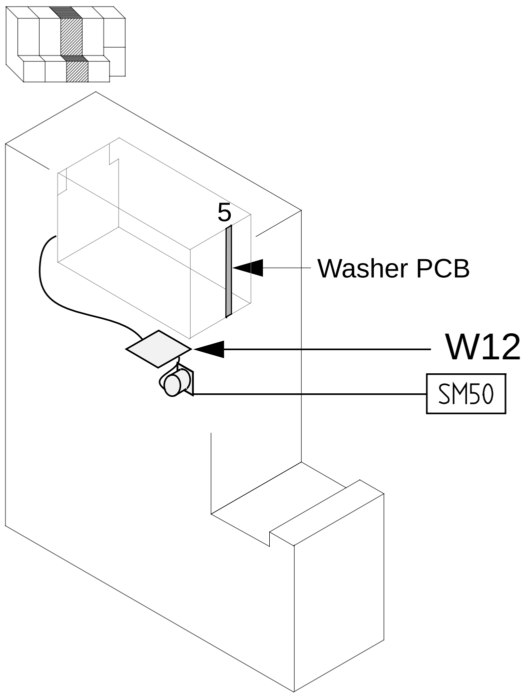
4.5.7 3D Drawing Washer Lift: Dwg. 147 733 revision 00

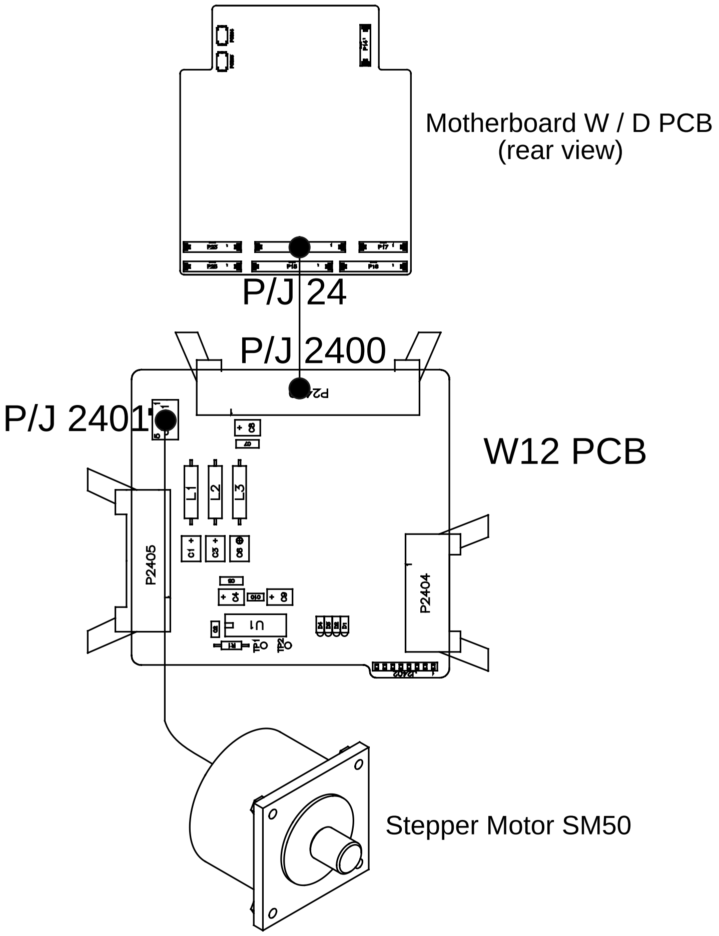

Wash Shell
W12
W14
W16
Manifold
15
55
14
18
16
55
13(C)
56
12(A)
2(B)
48(C)
63(T)
54
60
24
4
56
46
56
38
56
59
61
26
53
63(T)
60
63(T)
30
51
56
17
51
50
11
37 / 47
29
40(A)
3
56
54
57
43
56
42(A)
37 / 47
56
27
54
60
63(T)
53
63(T)
28
5
49(C)
6
44(A)
56
57
39
53
63(T)
57
36
41(A)
52
9
51
21
7
20
10
58
62(A)
32
19
25
20
58
34
57
35
31(C)
66(B)
33
22
23
45
53
63(T)
148229(C)
8
56
56
1(Z)

Service Part Class
.......(...)

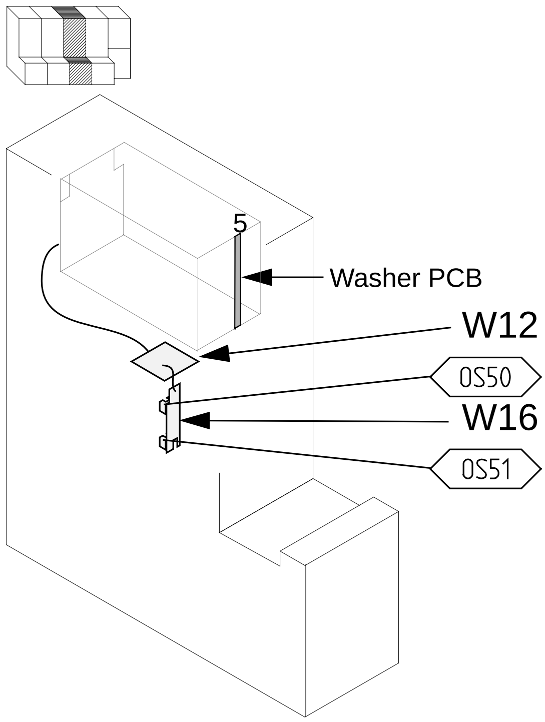
4.5.8 Troubleshooting

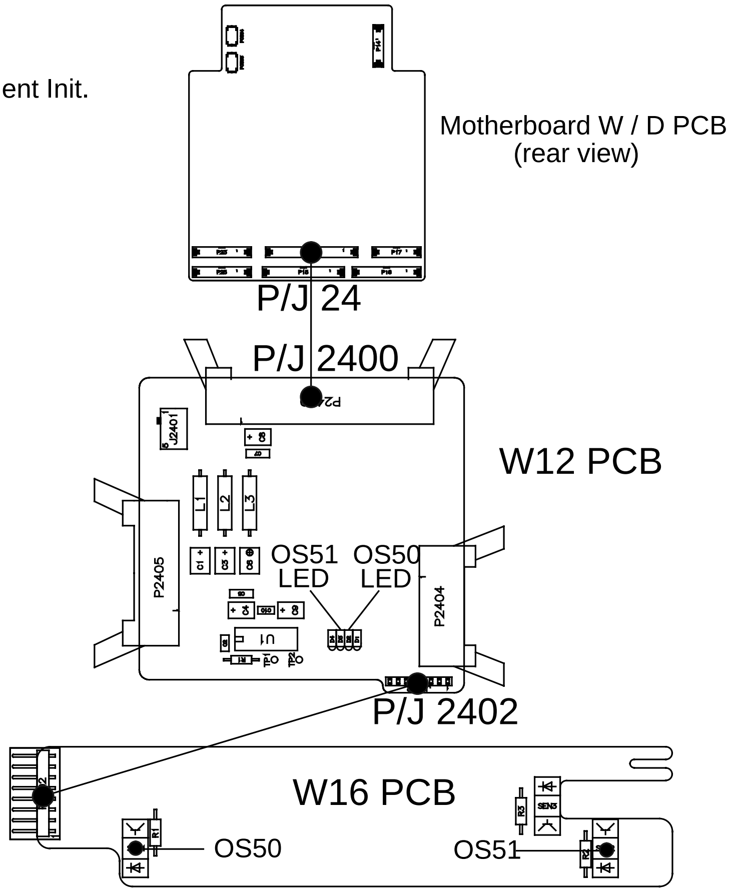
Module:	Washer / Dispenser
Assembly:	Washer Lift
Actor:	Step Motor SM50 Z-Movement
Boards:	W12, Washer PCB Motherboard W / D
Error Message:	


5
Washer PCB
W12
SM50

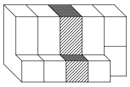

Motherboard W / D PCB
(rear view)
P/J 24
P/J 2400
P/J 2401
W12 PCB
L1
L2
L3
P2405
P2404
U1
Stepper Motor SM50

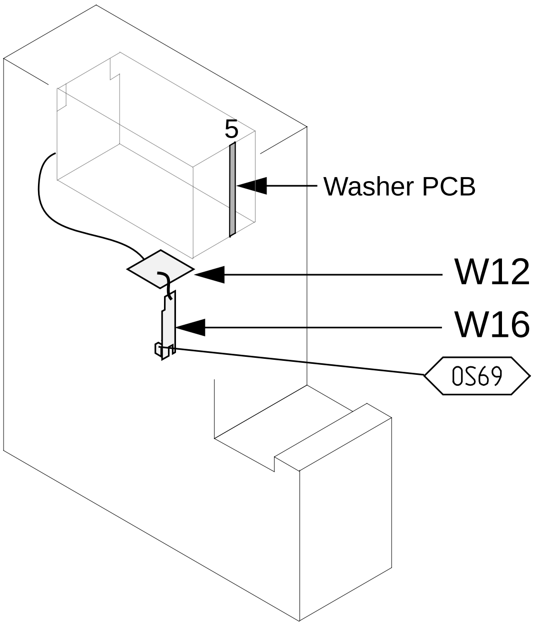
Module:	Washer / Dispenser
Assembly:	Washer Lift
Sensors:	Optical Switches OS50 Z-Movement Init. OS51 Z-Movement Position
Boards:	W12, W16, Washer PCB Motherboard W / D
Error Message:	

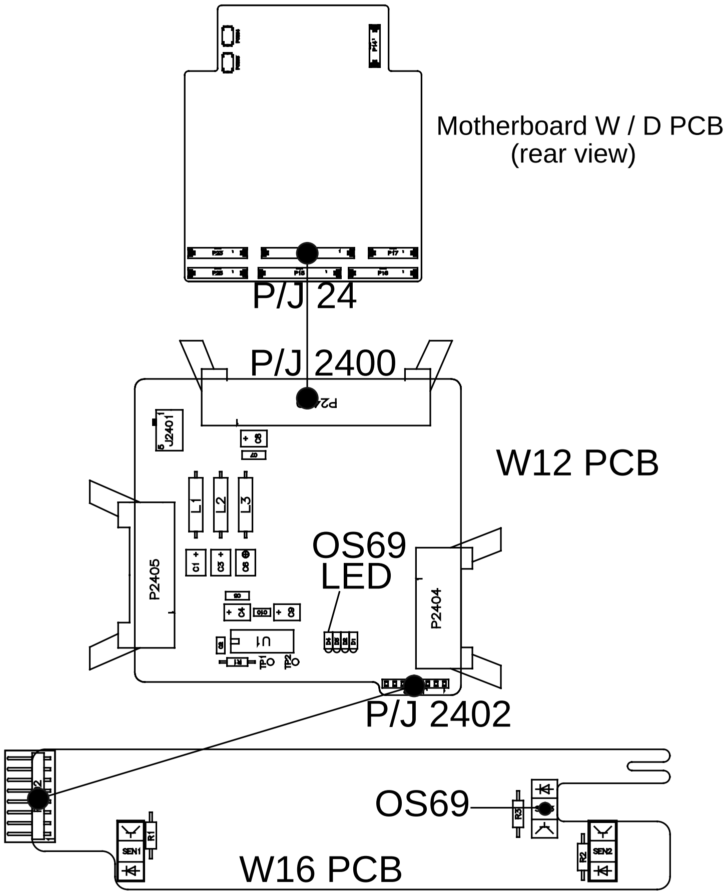

5
Washer PCB
W12
OS50
W16
OS51


Motherboard W / D PCB
(rear view)
P/J 24
P/J 2400
J2401
W12 PCB
L1
L2
L3
P2405
P2404
OS51 LED
OS50 LED
U1
P/J 2402
W16 PCB
OS50
OS51

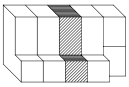
Module:	Washer / Dispenser
Assembly:	Washer Lift
Sensor:	Optical Switch OS69 Wash Shell End Position
Boards:	W12, W16, Washer PCB Motherboard W / D
Error Message:	

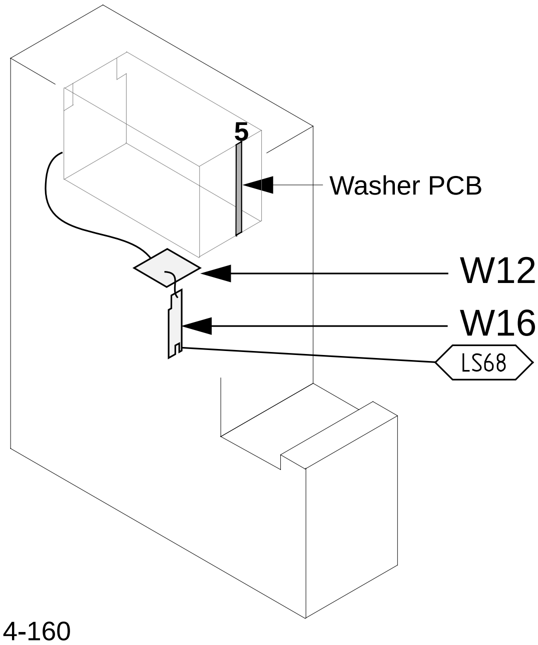


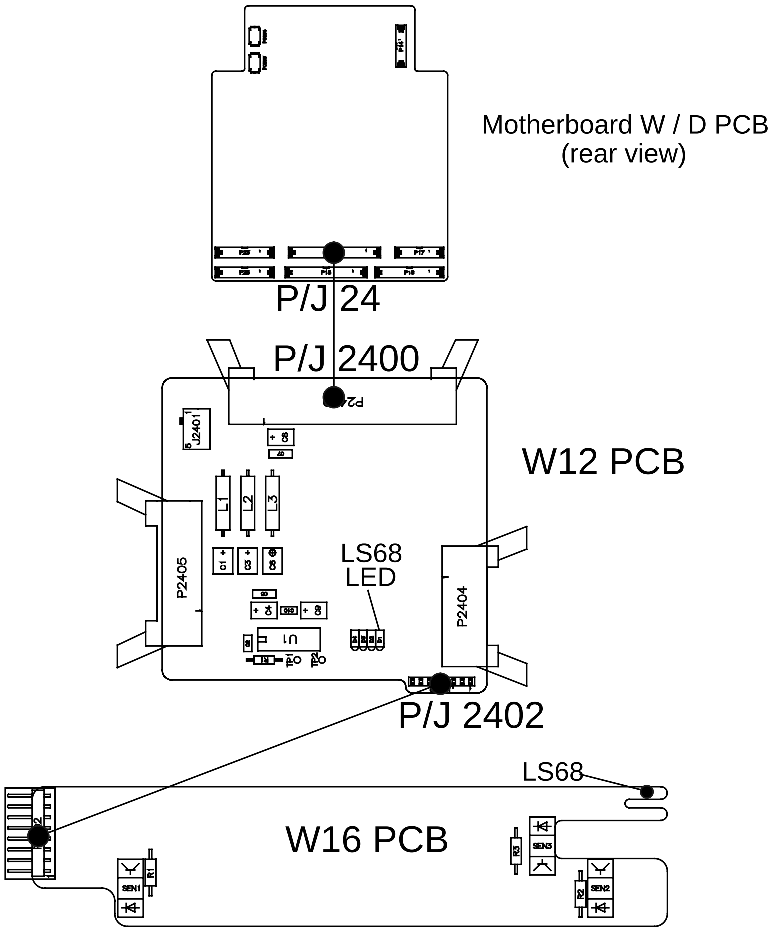

5
Washer PCB
W12
W16
OS69


Motherboard W / D PCB
(rear view)
P/J 24
P/J 2400
W12 PCB
J2401
L1
L2
L3
P2405
P2404
OS69
LED
U1
P/J 2402
OS69
R1
R2
R3
SEN1
SEN2
W16 PCB

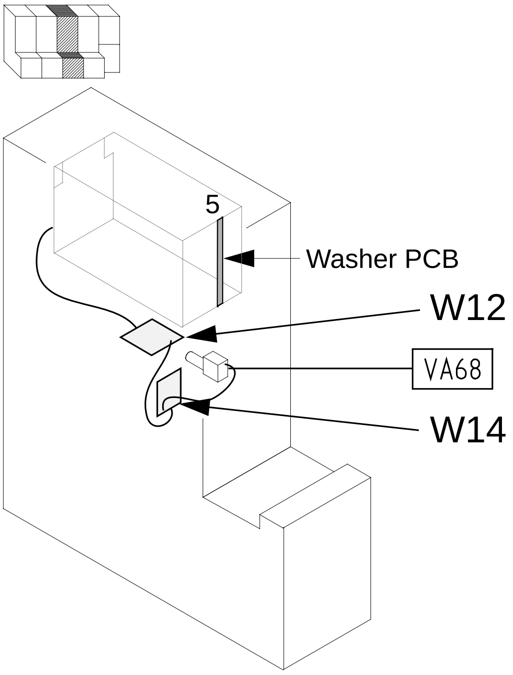
Module:	Washer / Dispenser
Assembly:	Washer Lift
Sensor:	Liquid Level Sensor LS68 Wash Shell Overflow
Boards:	W12, W16, Washer PCB Motherboard W / D
Error Message:	

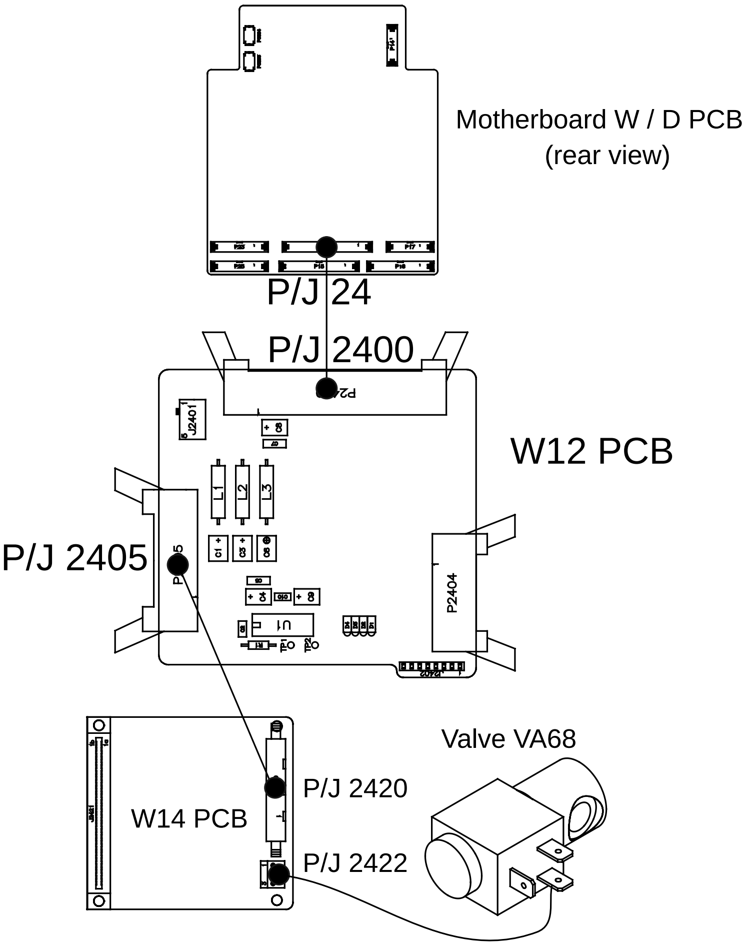



5
Washer PCB
W12
W16
LS68

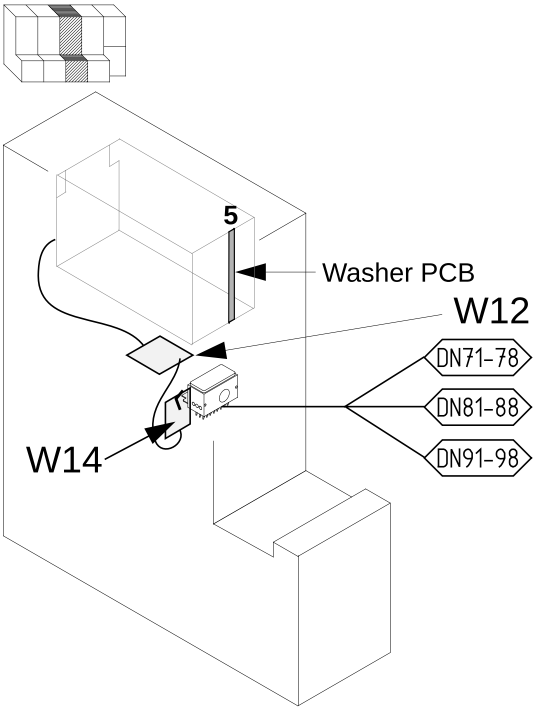

Motherboard W / D PCB
(rear view)
P/J 24
P/J 2400
W12 PCB
J2401
L1
L2
L3
P2405
P2404
LS68
LED
U1
P/J 2402
LS68
W16 PCB
R1
R2
R3
SEN1
SEN2
SEN3

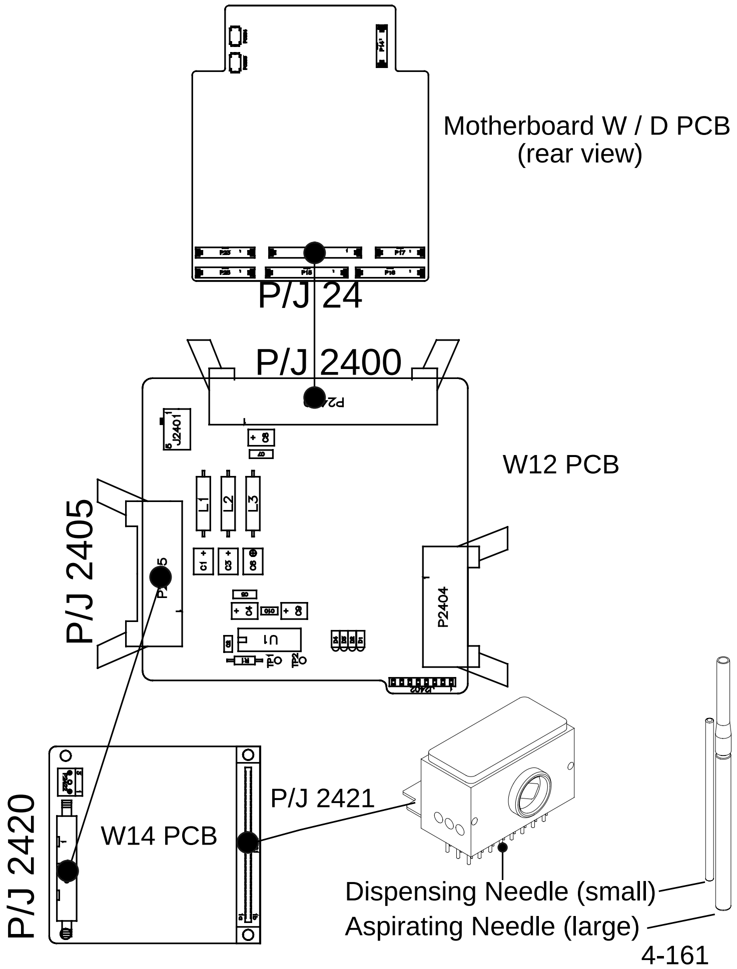
Module: Washer / Dispenser
Assembly: Washer Lift
Actor: Valve VA68 Dispensing Valve
Boards: W12, W14, Washer PCB
Motherboard W / D
Error Message:


5
Washer PCB
W12
VA68
W14

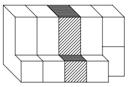

Motherboard W / D PCB
(rear view)
P/J 24
P/J 2400
W12 PCB
P/J 2405
P2404
J2401
L1
L2
L3
U1
W14 PCB
P/J 2420
P/J 2422
Valve VA68

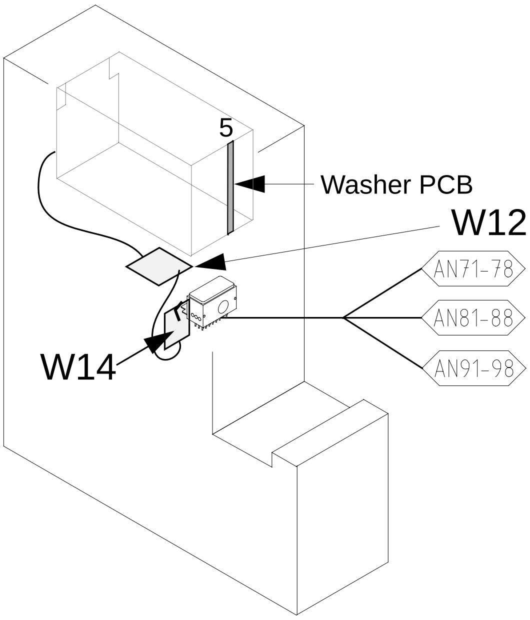
Module: Washer / Dispenser
Assembly: Washer Lift
Sensors: Dispensing Needles:
DN71-78, DN81-88, DN91-98
Boards: W12, W14, W15 (Manifold),
Washer PCB, Motherboard W / D
Error Message:

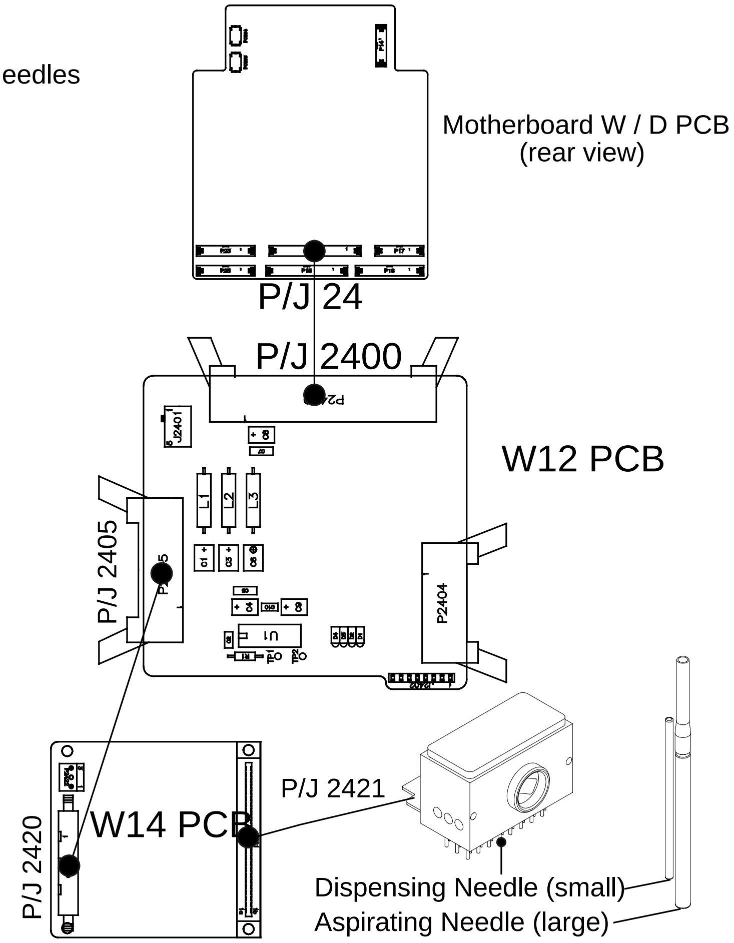

5
Washer PCB
W12
DN71-78
DN81-88
DN91-98
W14


Motherboard W / D PCB
(rear view)
P/J 24
P/J 2400
W12 PCB
P/J 2405
P2404
J2401
L1
L2
L3
U1
P/J 2420
W14 PCB
P/J 2421
Dispensing Needle (small)
Aspirating Needle (large)

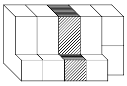
Module:	Washer / Dispenser
Assembly:	Washer Lift
Sensors:	Liquid Level Sensors, Aspirating Needles AN71-78, AN81-88, AN91-98
Boards:	W12, W14, W15 (Manifold), Washer PCB, Motherboard W / D
Error Message:	

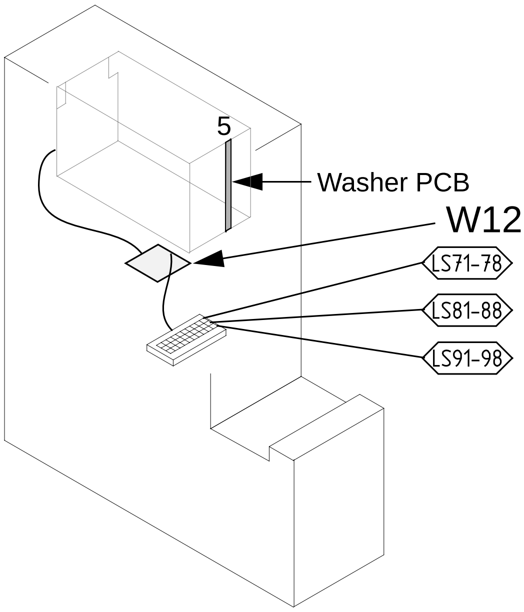


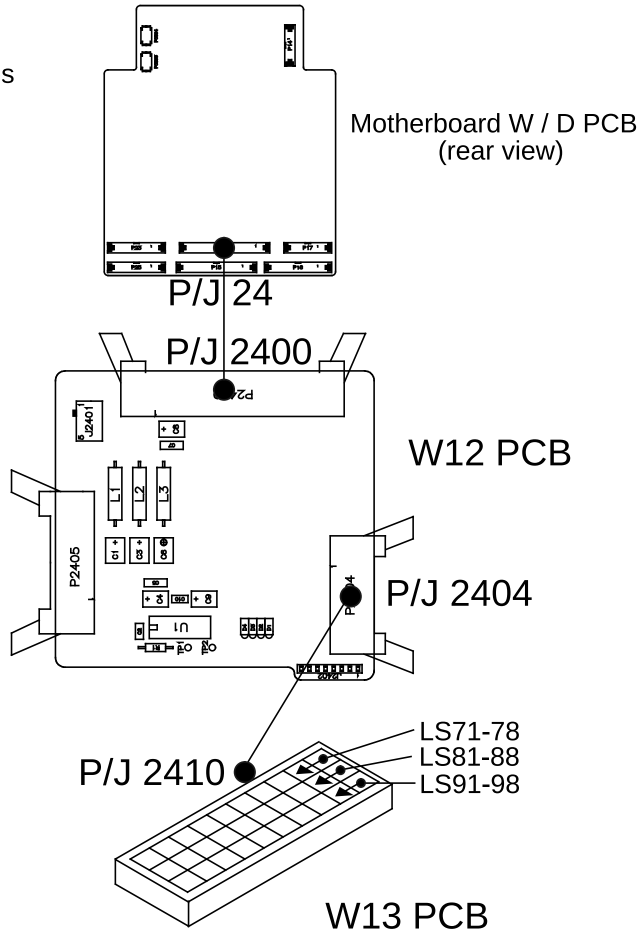

5
Washer PCB
W12
AN71-78
AN81-88
AN91-98
W14


Motherboard W / D PCB
(rear view)
P/J 24
P/J 2400
W12 PCB
P/J 2405
P2404
P/J 2421
W14 PCB
P/J 2420
Dispensing Needle (small)
Aspirating Needle (large)

Module:	Washer / Dispenser
Assembly:	Washer Lift
Sensors:	Liquid Level Sensors, Receiver Electrodes LS71-78, LS81-88, LS91-98
Boards:	W12, W13, Washer PCB, Motherboard W / D
Error Message:	



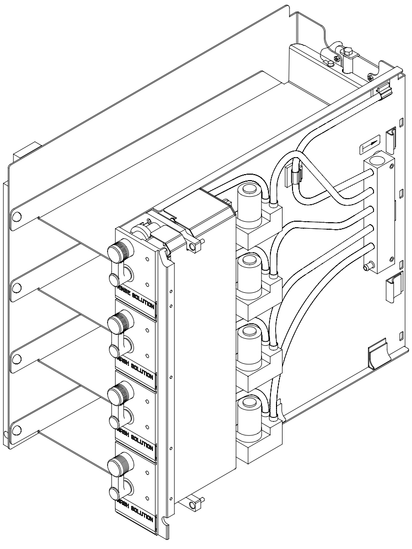

5
Washer PCB
W12
LS71-78
LS81-88
LS91-98


Motherboard W / D PCB
(rear view)
P/J 24
P/J 2400
W12 PCB
P2405
P/J 2404
P/J 2410
LS71-78
LS81-88
LS91-98
W13 PCB

External Pump Station

147 488

- Functional Description
- External Pump Station PCB
- Wiring Diagram
- Replacing Spare Parts
- Spare Parts List
- 3D Drawing
- Troubleshooting



4.6 External Pump Station 147 488

4.6.1 Functional Description

4.6.2 External Pump Station PCB

Overview

The external pump station PCB is an “intelligent” periphery print that enables operation of the activators and sensors in the external pump station over an RS-232 interface.

The PCB is subdivided into the following functional groups:

Voltage Supply:

- ❒ The PCB comprises its own voltage supply at 5VDC.

Management of the PCB:

- ❒ The central unity builds a microprocessor system with the 80C196KC-16 microprocessor, a 32K EPROM, and an 8K RAM.
- ❒ The microprocessor is capable of communicating over the internal RS-232 interface to a master microprocessor.

Pumps:

- ❒ Control and regulation of the membrane pumps PM61 ... Pm64.

Activators:

- ❒ 8 LED (LY61... LY64; LG61... LG64)

Sensors:

- ❒ 4 level-sensors (LS61... LS64)
- ❒ 8 fork optical switches (OS61...OS68)

Voltage Supply

The PCB voltage supply is 5VDC. The input-voltage-range lies between 7VDC and 25VDC. The circuit is protected against overload by a 200mA multi-fuse.

Microprocessor System

Highlights of the microprocessor system:

- ❐ N80C196KC 16-bit CPU
- ❐ 16MHz clock speed
- ❐ Wait state set on 1
- ❐ 16-bit bus-width address (over latch HC573O)
- ❐ 8-bit data bus-width
- ❐ 32k-byte code memory in EPROM
- ❐ 8k-byte RAM 250ns
- ❐ serial interface with MAX232-driver and ESD-protection diodes
- ❐ 8 A/D - converter inputs of which 3 are used
- ❐ 3 puls generators of which 2 are used
- ❐ RESET control with TL7705 voltage supervisor

Pump Control

One pump controller allows operation of the membrane pumps PM61 until PM64. Control of a pump is limited to a maximum current of 1A. The load is driven in the “sink-mode” and finds itself in the switched off condition with a potential of 23V. Control or regulation occurs over the pulse-width outputs of the microprocessor 80KC196 via the software. The current intensity in the load-circuit is measured over a precision resistance measurement between the source of the switch-FETs is periodically saved over a sample-and-hold section. This section is self-operated over the pulse-width signal.

To guarantee operation safety, the control is taken care of by a “watchdog”-concept. A controlled switching off of the pumps is carried out during a software crash. The pumps are also switched off during a reset (RESET_IO).

LED

The 8 LEDs, for indicating wash / rinse-container-access, can be individually switched on and off as well as blink over port PB of the 82C55. LED intensity can be adjusted over a PWM-output of the microprocessor.

Sensors

The 8 fork-optical switches for fluid-connection monitoring are read over the port PA of the 82C55. In order to increase their service life, the optical switches are only switched on during the calling up period. This occurs over a port of the microprocessor.

The level sensors, which deliver a digital signal, are read over the PC port (upper nibbel) of the 82C55. The inputs are protected by a C against frequent interferences (false readings).

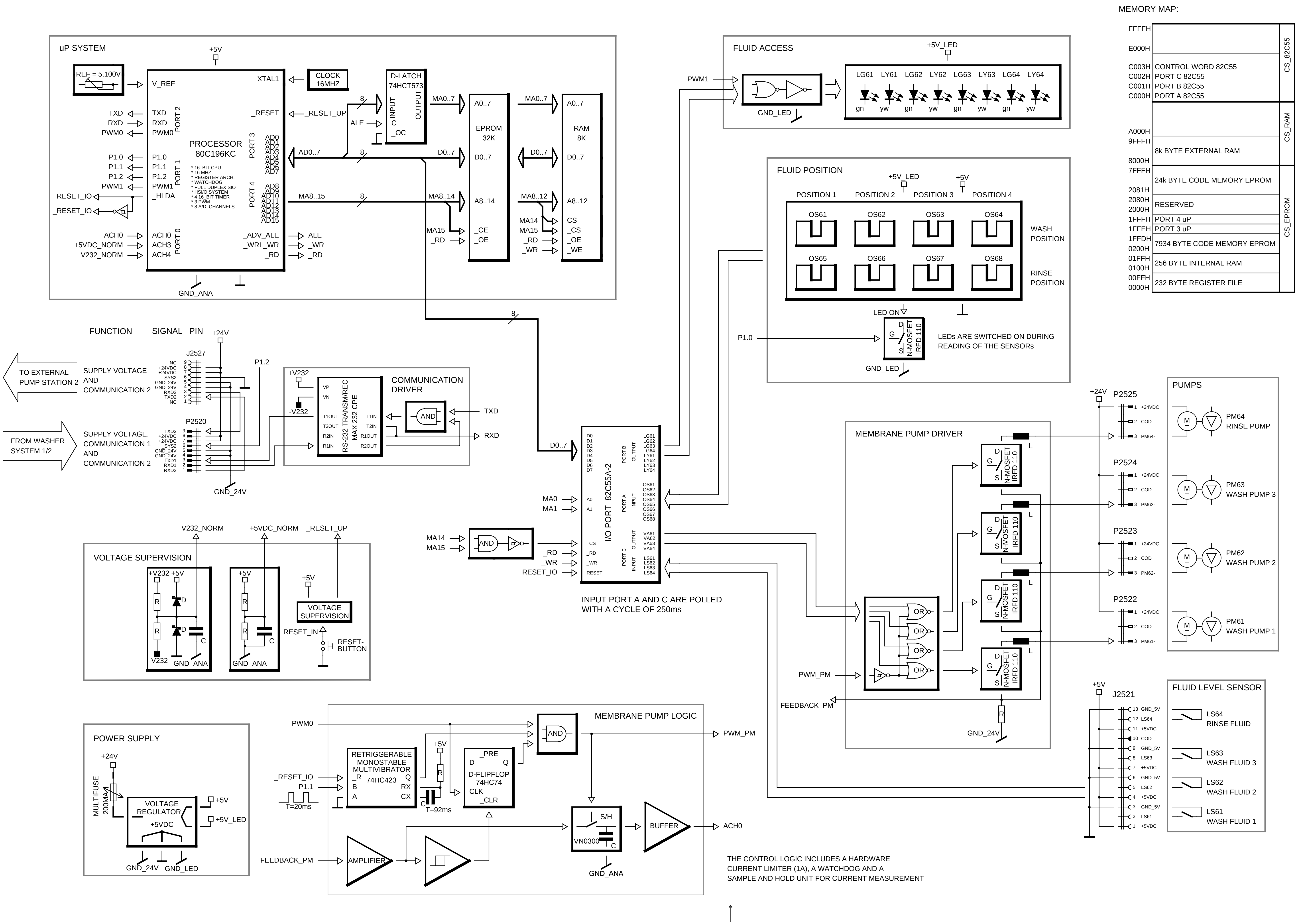
Refer to the drawing on the following page:

- ❒ External Pump Station PCB (block diagram):

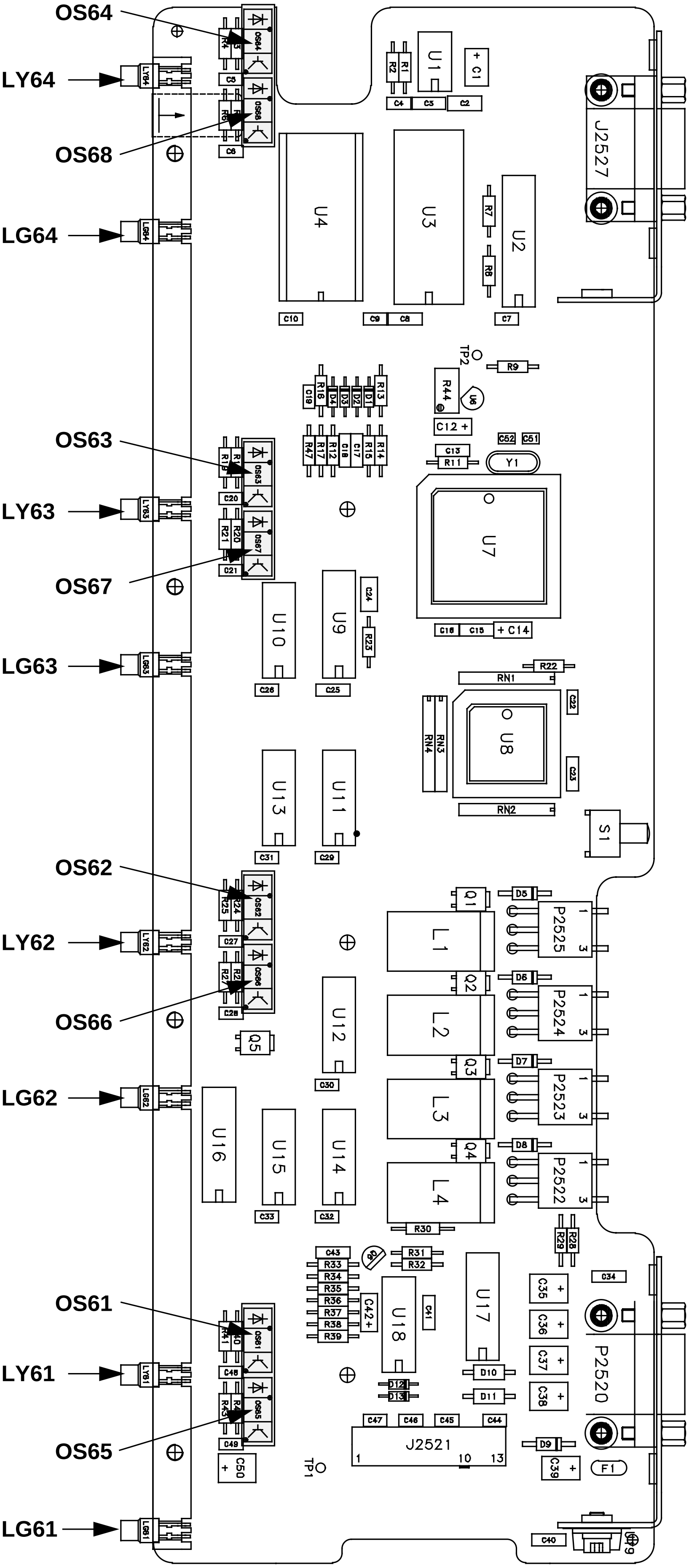
  Dwg No. 614 132

Block Diagram External Pump Station PCB

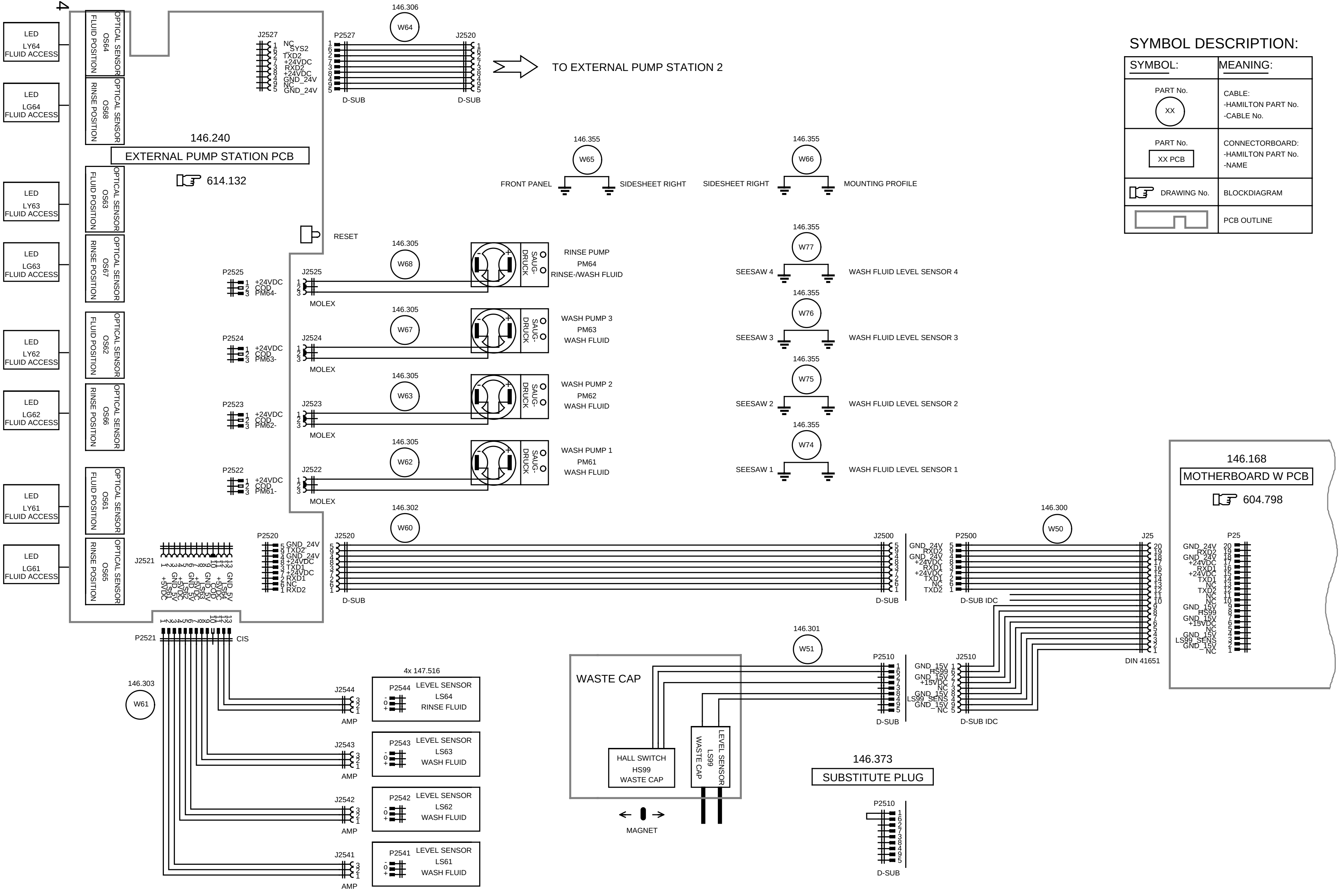
614.132 revision 00


MEMORY MAP:
FFFFH
E000H
C003H CONTROL WORD 82C55
C002H PORT C 82C55
C001H PORT B 82C55
C000H PORT A 82C55
CS_82C55
A000H
9FFFH
8k BYTE EXTERNAL RAM
8000H
CS_RAM
7FFFH
24k BYTE CODE MEMORY EPROM
2081H
2080H RESERVED
2000H
1FFFH PORT 4 uP
1FFEH PORT 3 uP
1FFDH
7934 BYTE CODE MEMORY EPROM
0200H
01FFH
256 BYTE INTERNAL RAM
0100H
00FFH
232 BYTE REGISTER FILE
0000H
CS_EPROM
uP SYSTEM
+5V
REF = 5.100V
V_REF
XTAL1
CLOCK 16MHZ
TXD
RXD
PWM0
PORT 2
_RESET
_RESET_UP
P1.0
P1.1
P1.2
PWM1
PORT 1
_HLDA
RESET_IO
_RESET_IO
PROCESSOR 80C196KC
* 16_BIT CPU
* 16 MHZ
* REGISTER ARCH.
* WATCHDOG
* FULL DUPLEX SIO
* HSI/O SYSTEM
* 4 16_BIT TIMER
* 3 PWM
* 8 A/D_CHANNELS
PORT 3
AD0 AD1 AD2 AD3 AD4 AD5 AD6 AD7
PORT 4
AD8 AD9 AD10 AD11 AD12 AD13 AD14 AD15
ACH0
+5VDC_NORM
ACH3
V232_NORM
ACH4
PORT 0
_ADV_ALE
ALE
_WRL_WR
_WR
_RD
GND_ANA
D-LATCH 74HCT573
INPUT
OUTPUT
C
_OC
ALE
8
MA0..7
AD0..7
D0..7
MA8..15
MA8..14
MA15
_RD
EPROM 32K
A0..7
D0..7
A8..14
_CE
_OE
RAM 8K
MA0..7
D0..7
MA8..12
MA14
MA15
_RD
_WR
A0..7
D0..7
A8..12
CS
_CS
_OE
_WE
FLUID ACCESS
+5V_LED
PWM1
GND_LED
LG61 LY61 LG62 LY62 LG63 LY63 LG64 LY64
gn yw gn yw gn yw gn yw
FLUID POSITION
+5V_LED
+5V
POSITION 1
POSITION 2
POSITION 3
POSITION 4
OS61 OS62 OS63 OS64
OS65 OS66 OS67 OS68
WASH POSITION
RINSE POSITION
LED ON
P1.0
G
D
S
N-MOSFET IRFD 110
LEDs ARE SWITCHED ON DURING READING OF THE SENSORs
GND_LED
FUNCTION
SIGNAL
PIN
+24V
J2527
TO EXTERNAL PUMP STATION 2
SUPPLY VOLTAGE AND COMMUNICATION 2
NC
+24VDC
+24VDC
SYS2
GND_24V
GND_24V
RXD2
TXD2
NC
P1.2
P2520
FROM WASHER SYSTEM 1/2
SUPPLY VOLTAGE, COMMUNICATION 1 AND COMMUNICATION 2
TXD2
+24VDC
+24VDC
SYS2
GND_24V
GND_24V
TXD1
RXD1
RXD2
GND_24V
+V232
-V232
VP
VN
RS-232 TRANSM/REC MAX 232 CPE
T1OUT
T2OUT
R2IN
R1IN
T1IN
T2IN
R1OUT
R2OUT
COMMUNICATION DRIVER
AND
TXD
RXD
8
D0..7
I/O PORT 82C55A-2
D0 D1 D2 D3 D4 D5 D6 D7
PORT B OUTPUT
LG61 LG62 LG63 LG64 LY61 LY62 LY63 LY64
PORT A INPUT
OS61 OS62 OS63 OS64 OS65 OS66 OS67 OS68
PORT C OUTPUT
VA61 VA62 VA63 VA64
PORT C INPUT
LS61 LS62 LS63 LS64
MA0
MA1
A0
A1
MA14
MA15
AND
_CS
_RD
_WR
RESET_IO
RESET
INPUT PORT A AND C ARE POLLED WITH A CYCLE OF 250ms
V232_NORM
+5VDC_NORM
_RESET_UP
VOLTAGE SUPERVISION
+V232 +5V
R
D
R
D
C
-V232
GND_ANA
+5V
R
R
C
GND_ANA
+5V
VOLTAGE SUPERVISION
RESET_IN
RESET-BUTTON
POWER SUPPLY
+24V
MULTIFUSE 200MA
VOLTAGE REGULATOR
+5VDC
+5V
+5V_LED
GND_24V
GND_LED
MEMBRANE PUMP LOGIC
PWM0
AND
PWM_PM
_RESET_IO
P1.1
T=20ms
RETRIGGERABLE MONOSTABLE MULTIVIBRATOR
_R
B
A
74HC423
Q
RX
CX
+5V
R
C
T=92ms
_PRE
D
Q
D-FLIPFLOP 74HC74
CLK
_CLR
S/H
VN0300
C
BUFFER
ACH0
FEEDBACK_PM
AMPLIFIER
GND_ANA
THE CONTROL LOGIC INCLUDES A HARDWARE CURRENT LIMITER (1A), A WATCHDOG AND A SAMPLE AND HOLD UNIT FOR CURRENT MEASUREMENT
MEMBRANE PUMP DRIVER
OR
OR
OR
OR
PWM_PM
FEEDBACK_PM
D
G
S
N-MOSFET IRFD 110
L
R
GND_24V
+24V
P2525
1 +24VDC
2 COD
3 PM64-
P2524
1 +24VDC
2 COD
3 PM63-
P2523
1 +24VDC
2 COD
3 PM62-
P2522
1 +24VDC
2 COD
3 PM61-
PUMPS
M
PM64 RINSE PUMP
PM63 WASH PUMP 3
PM62 WASH PUMP 2
PM61 WASH PUMP 1
+5V
J2521
13 GND_5V
12 LS64
11 +5VDC
10 COD
9 GND_5V
8 LS63
7 +5VDC
6 GND_5V
5 LS62
4 +5VDC
3 GND_5V
2 LS61
1 +5VDC
FLUID LEVEL SENSOR
LS64 RINSE FLUID
LS63 WASH FLUID 3
LS62 WASH FLUID 2
LS61 WASH FLUID 1

External Pump Station, Component Layout: 146 240 revision 03


OS64
LY64
OS68
LG64
OS63
LY63
OS67
LG63
OS62
LY62
OS66
LG62
OS61
LY61
OS65
LG61
U1
U2
U3
U4
U7
U8
U9
U10
U11
U12
U13
U14
U15
U16
U17
U18
J2527
J2521
P2520
P2522
P2523
P2524
P2525
L1
L2
L3
L4
Q1
Q2
Q3
Q4
Q5
S1
Y1
F1
TP1
TP2
RN1
RN2
RN3
RN4

4.6.3 Wiring Diagram External Pump Station: Dwg. 604 496 revision 02


146.240
EXTERNAL PUMP STATION PCB
614.132
LED LY64 FLUID ACCESS
LED LG64 FLUID ACCESS
LED LY63 FLUID ACCESS
LED LG63 FLUID ACCESS
LED LY62 FLUID ACCESS
LED LG62 FLUID ACCESS
LED LY61 FLUID ACCESS
LED LG61 FLUID ACCESS
OPTICAL SENSOR OS64 FLUID POSITION
OPTICAL SENSOR OS68 RINSE POSITION
OPTICAL SENSOR OS63 FLUID POSITION
OPTICAL SENSOR OS67 RINSE POSITION
OPTICAL SENSOR OS62 FLUID POSITION
OPTICAL SENSOR OS66 RINSE POSITION
OPTICAL SENSOR OS61 FLUID POSITION
OPTICAL SENSOR OS65 RINSE POSITION
J2527
NC
SYS2
TXD2
+24VDC
RXD2
+24VDC
GND_24V
NC
GND_24V
146.306
W64
P2527
J2520
D-SUB
D-SUB
TO EXTERNAL PUMP STATION 2
RESET
146.355
W65
FRONT PANEL
SIDESHEET RIGHT
146.355
W66
SIDESHEET RIGHT
MOUNTING PROFILE
146.305
W68
P2525
J2525
+24VDC
COD
PM64-
MOLEX
SAUG- DRUCK
RINSE PUMP
PM64
RINSE-/WASH FLUID
146.305
W67
P2524
J2524
PM63-
WASH PUMP 3
PM63
WASH FLUID
146.305
W63
P2523
J2523
PM62-
WASH PUMP 2
PM62
WASH FLUID
146.305
W62
P2522
J2522
PM61-
WASH PUMP 1
PM61
WASH FLUID
146.355
W77
SEESAW 4
WASH FLUID LEVEL SENSOR 4
146.355
W76
SEESAW 3
WASH FLUID LEVEL SENSOR 3
146.355
W75
SEESAW 2
WASH FLUID LEVEL SENSOR 2
146.355
W74
SEESAW 1
WASH FLUID LEVEL SENSOR 1
J2521
P2520
GND_24V
TXD2
GND_24V
+24VDC
TXD1
+24VDC
RXD1
NC
RXD2
146.302
W60
J2520
D-SUB
J2500
D-SUB
P2500
D-SUB IDC
146.300
W50
J25
DIN 41651
146.168
MOTHERBOARD W PCB
604.798
P25
GND_24V
RXD2
GND_24V
+24VDC
RXD1
+24VDC
TXD1
NC
TXD2
NC
NC
GND_15V
HS99
GND_15V
+15VDC
NC
GND_15V
LS99_SENS
GND_15V
NC
P2521
CIS
146.303
W61
4x 147.516
J2544
P2544
LEVEL SENSOR
LS64
RINSE FLUID
J2543
P2543
LEVEL SENSOR
LS63
WASH FLUID
J2542
P2542
LEVEL SENSOR
LS62
WASH FLUID
J2541
P2541
LEVEL SENSOR
LS61
WASH FLUID
AMP
WASTE CAP
HALL SWITCH
HS99
WASTE CAP
LEVEL SENSOR
LS99
WASTE CAP
MAGNET
146.301
W51
P2510
D-SUB
J2510
D-SUB IDC
146.373
SUBSTITUTE PLUG
P2510
D-SUB

SYMBOL DESCRIPTION:

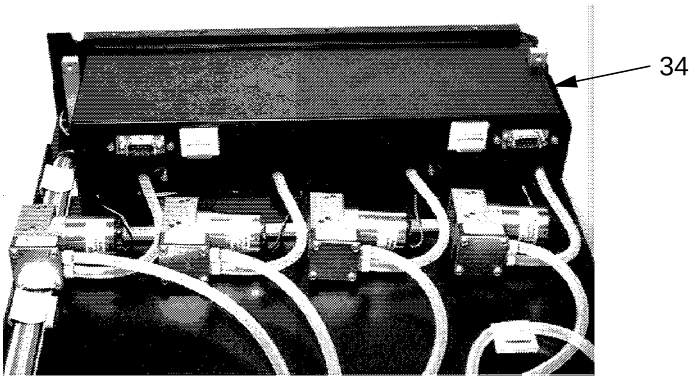
SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
☞ DRAWING No.	BLOCKDIAGRAM
	PCB OUTLINE

4.6.4 Replacing spare parts

NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

4.6.4.1 Removing and remounting of PCB cover item 34

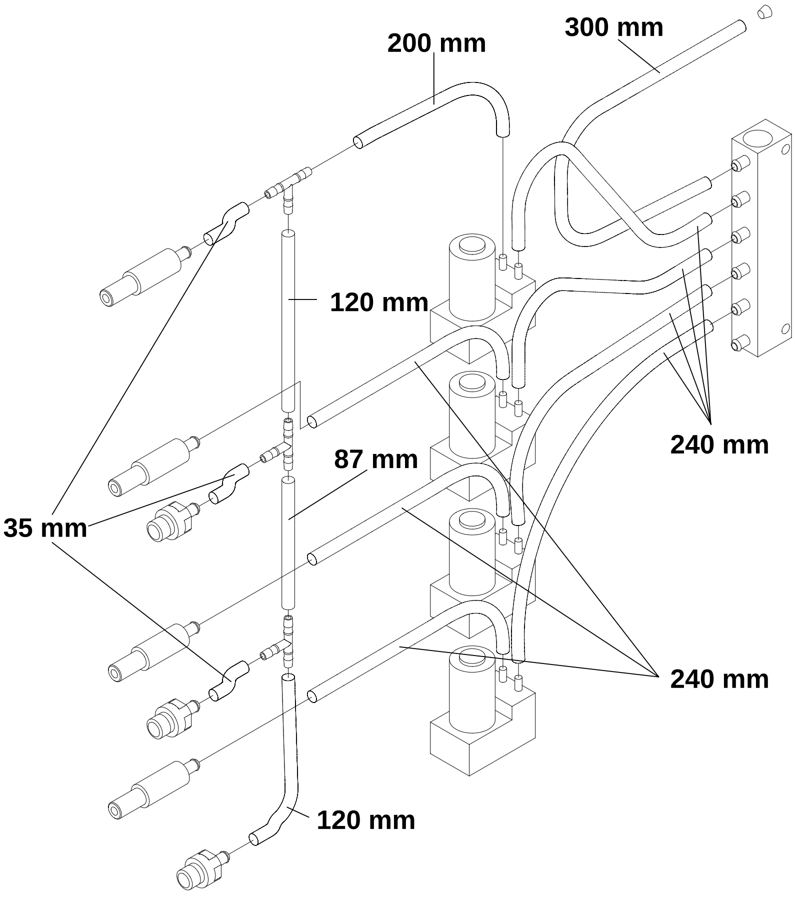
Unscrew (6 screws) and carefully remove PCB cover.



Pay special attention to not damage *external pump station PCB item 32* when remounting PCB cover.

4.6.4.2 Silicone Tubing item 19

Refer to the following drawing for tubing lengths and installation.

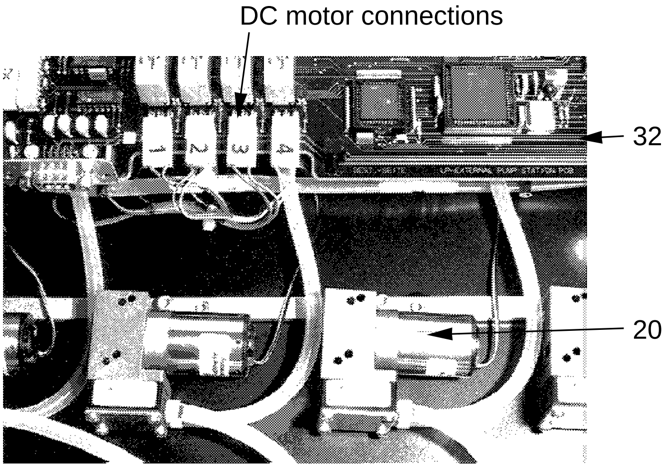


4.6.4.3 DC motor W PM61 item 20

Remove *external pump station PCB item 32* (see section 4.6.4.4).

Disconnect the two tubes.

Unscrew and replace *DC motor item 20* (1 screw).



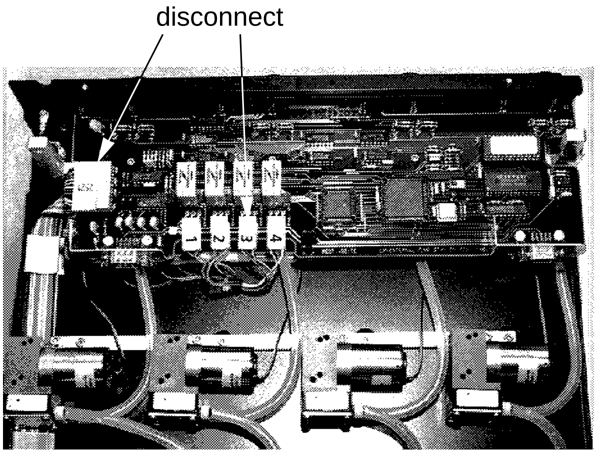
When remounting, replace the piece of rubber between the pump mounting clamp and the pump to ensure a tight fit.

4.6.4.4 External pump station PCB item 32

Remove *PCB cover item 34* (see section 4.6.4.1).

Disconnect the four *DC motors items 20* and *cable W61 item 47.*

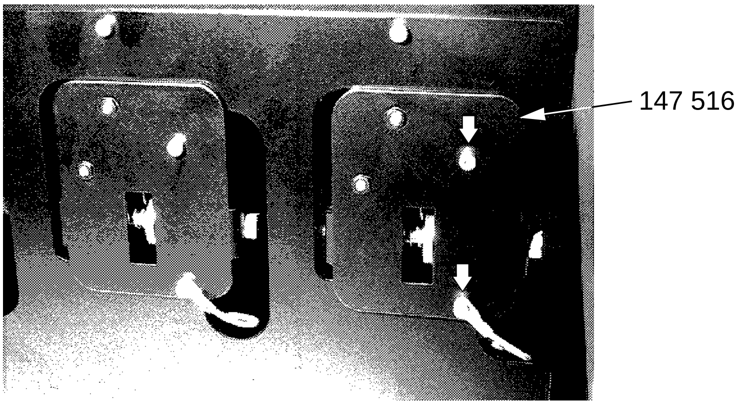
Unscrew External Pump Station PCB and replace.



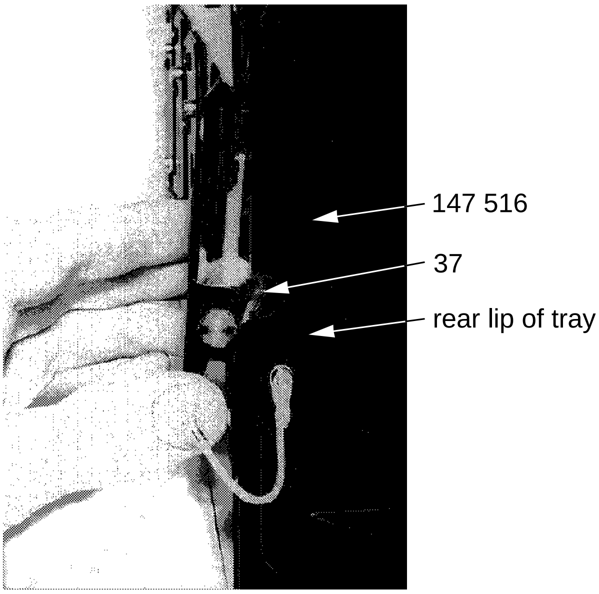
When remounting, replace the piece of rubber between the pump mounting clamp and the pump to ensure a tight fit.

4.6.4.5 Wash fluid level sensor p/n 147 516

Unscrew Wash Fluid Level Sensor (2 screws).



When remounting, make sure that the rear lip of the tray is above flange on *sleeve item 37* (see the following picture).


147 516
37
rear lip of tray

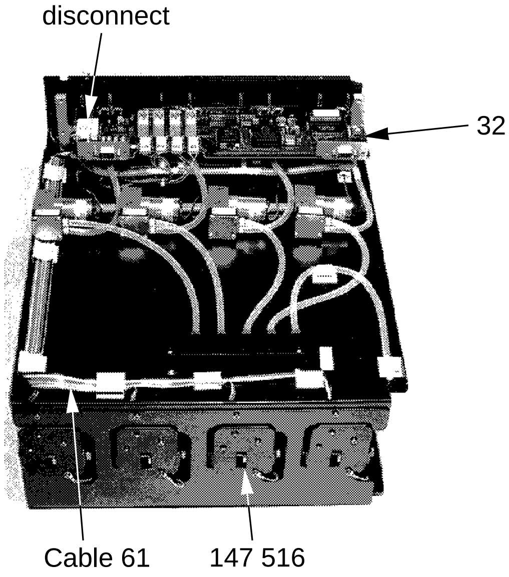
4.6.4.6 Cable W61 item 47

Remove *PCB cover item 34* (see section 4.6.4.1).

Disconnect Cable W61 on *External Pump Station PCB item 32*, free cable from cable clamps.

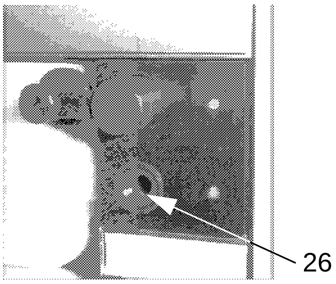
Unscrew lowest DC motor.

Remove the four wash fluid level sensors p/n 147 516 (refer to section 4.6.4.5), disconnect the four connectors of cable W61 and replace cable.



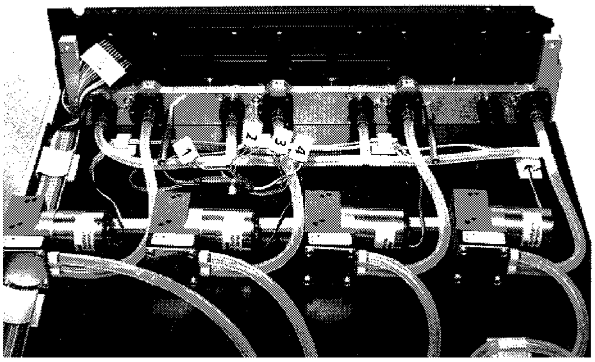
4.6.4.7 O-ring item 26

Use tweezers to remove the old O-ring. Insert the new O-ring by hand (do not use tweezers to install O-ring!).



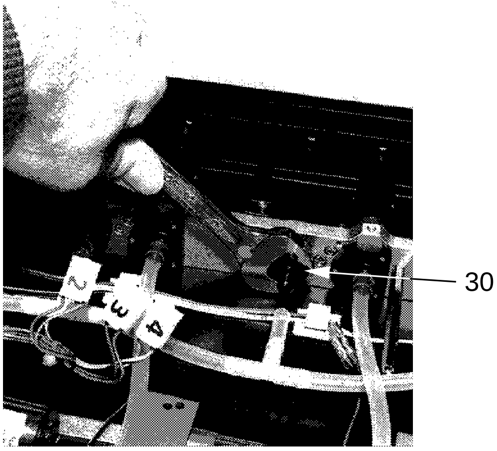
4.6.4.8 O-Rings items 15 and 28, Float item 27, Compression Springs items 29 and 60

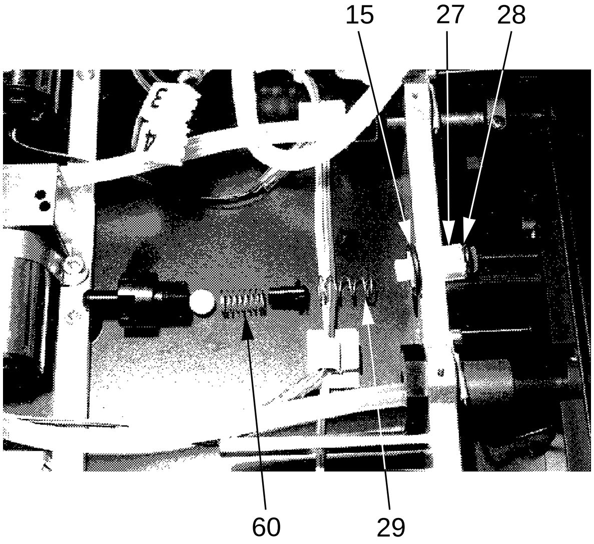
Remove External pump station PCB item 32 (see section 4.6.4.4).



Pull tube off unit to be repaired.

Unscrew *nozzle item 30* (use 16 mm / $^5/_8$" wrench) and replace worn parts.





4.6.4.9 EPROM

Remove *PCB cover item 34* (see section 4.6.4.1).

Remove the old EPROM using a chip extractor tool.

4.6.5 Spare Parts List

EXTERNAL PUMP STATION 147488 Revision: 02

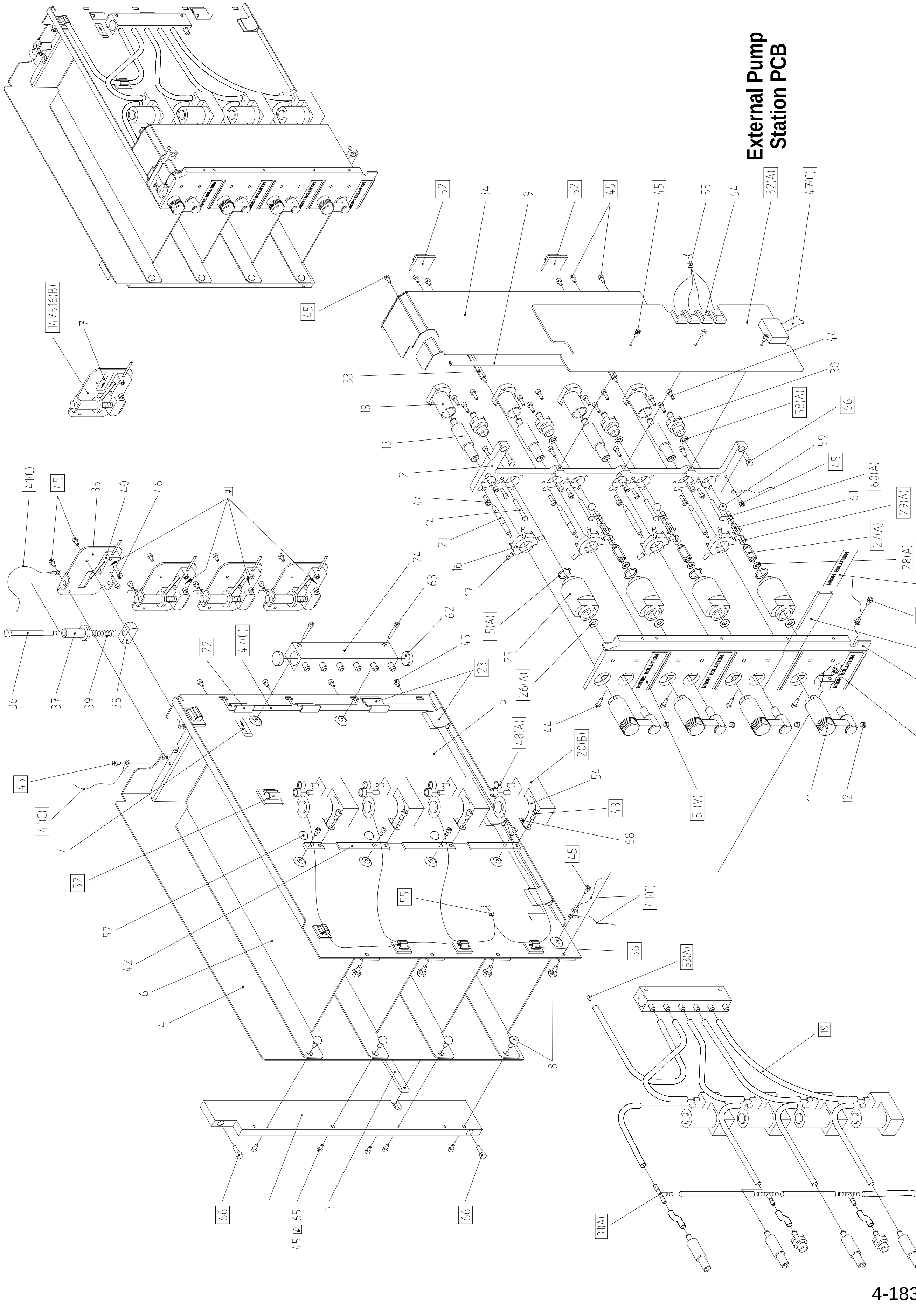
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147510	DREHPUNKTLEISTE LINKS	00	1	1.000	
147511	BEFESTIGUNGSPROFIL	00	2	1.000	
147515	FUEHRUNGSSCHIENE	00	3	1.000	
147491	SEITENBLECH LINKS	00	4	1.000	
147490	SEITENBLECH RECHTS	00	5	1.000	
147493	WANNE	00	6	4.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	7	1.000	
147514	ANSCHLAGBOLZEN	00	8	8.000	
7279267	KANTENSCHUTZ SCHLITZ B= 1,0	00	9	0.320	
147513	FRONTPLATTE	00	10	1.000	
147497	FLUIDCONNECTOR	01	11	4.000	
147499	STOPFEN	01	12	4.000	
147498	FUEHRUNGSROHR	01	13	4.000	
148241	HALTEBOLZEN	00	14	4.000	
254106	O-RING 12.00X2.00 VITON	00	15	4.000	A
147500	CODE-SCHEIBE	00	16	4.000	
405464	GEW.STIFT M4 X 8 VERZ DIN916	00	17	12.000	
147502	FUEHRUNGSHUELSE	00	18	4.000	
7249057	SILIKONSCHL 4 X 7 TRANSP	00	19	2.650	B
146305	DC MOTOR W PM61	00	20	4.000	B
147570	FUEHRUNGSSTIFT	00	21	4.000	
361004	KABELBEF. CFCC-4 1/2”	00	22	2.000	
361015	KABELBEF. 3484-1000	00	23	4.000	
148239	SAMMELROHR	00	24	1.000	
147503	VENTILROHR	00	25	4.000	
254105	O-RING 8.00X2.00 VITON	00	26	4.000	A
147489	SCHWIMMER	01	27	3.000	A
254130	O-RING ID 6x1.5 VITON	00	28	3.000	
256117	DRUCKFEDER D 0.63 DM 8 LO 16	00	29	3.000	A
147504	SCHLIESSHUELSE	00	30	4.000	
279336	T-ST?CK D = 4 MM POM	00	31	3.000	A
146240	EXTERNAL PUMP STATION PCB	02	32	1.000	A
257023	DIST.BOLZEN M3X60 I/A GEW.	00	33	2.000	
147492	ABSCHIRMBLECH	00	34	1.000	
147517	GRUNDPLATTE	00	35	4.000	B
147518	FUEHRUNGSSCHRAUBE	00	36	4.000	B
147519	STELLHUELSE	00	37	4.000	B
147520	STELLMUTTER	00	38	4.000	B
256118	DRUCKFEDER D 0.7 DM6.8 LO 35.8	00	39	4.000	B
370011	M-SWITCH HALLEFEKT-SCHALTER	00	40	4.000	A
146355	CABLE W65	00	41	6.000	C
147494	PUMPENHALTER	00	42	1.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	43	4.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	44	32.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	45	38.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
420316	ZYL-SCHR.M 3X14 DIN912 A2	00	46	8.000	
146303	CABLE W61	00	47	1.000	C
141239	KLEMMRING	01	48	8.000	A
148166	LABEL “WASH SOLUTION”	00	49	3.000	V
147622	LABELHOLDER	00	50	4.000	Z
147495	LABEL “RINSE SOLUTION”	00	51	1.000	V
361003	KABELBEF. 0250 S	00	52	4.000	
281110	STOPFEN D5.8 D7 L5 SILIKON	00	53	1.000	A
361033	KABELBEF. D=26MM	00	54	4.000	
361000	KABELBEF. L=100 B=2.5 MM	00	55	2.000	
361036	KABELHALTER	00	56	4.000	
279053	PUFFER D = 11,4 X 5,0 SZ	00	57	3.000	B
16101	O-RING ID 6,07X 1,78 NIT 70SH	00	58	3.000	A
279348	KUGEL POM 8+/-0,15	00	59	3.000	
256061	DRUCKFED d 0,5 Da 8 Lo 13,5	00	60	3.000	A
148242	EINLAGE	00	61	3.000	
148240	RONDELLE	00	62	2.000	
420314	ZYL-SCHR.M 3X20 DIN912 A2	00	63	2.000	
255039	TUERBESCHRIFTUNG	00	64	2.000	
511006	LOCTITE 222 50mL	00	65	0.000	T
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	66	4.000	
148332	KLEMMTEIL	00	68	4.000	

Service Assemblies (parts list 148236)

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147516	WASH FLUID LEVEL SENSOR	00			A

4.6.6 3D Drawing External Pump Station: Dwg 147 488 revision 00

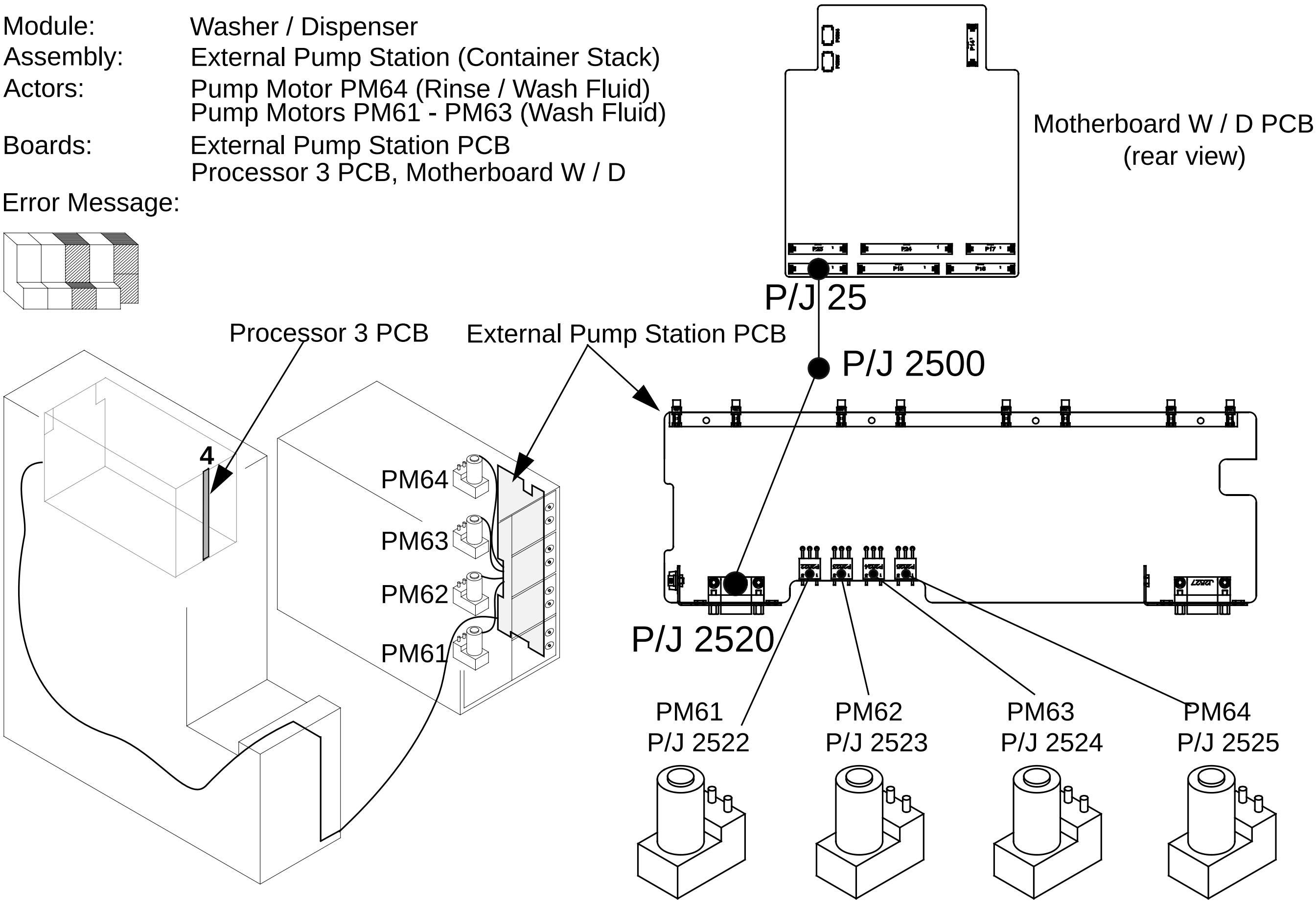

External Pump Station PCB
147516(B)
7
52
34
9
52
45
45
55
64
32(A)
47(C)
45
44
33
30
18
58(A)
66
13
59
2
45
60(A)
41(C)
45
35
40
46
44
61
29(A)
14
21
27(A)
16
24
28(A)
63
49(V)
17
62
45
15(A)
45
36
37
39
38
22
47(C)
25
50(Z)
23
26(A)
10
5
44
45 ⊠ 65
48(A)
20(B)
54
45
41(C)
7
52
11
12
51(V)
43
68
57
45
55
41(C)
42
56
6
53(A)
4
19
8
66
1
45 ⊠ 65
3
66
31(A)

Service Part Class

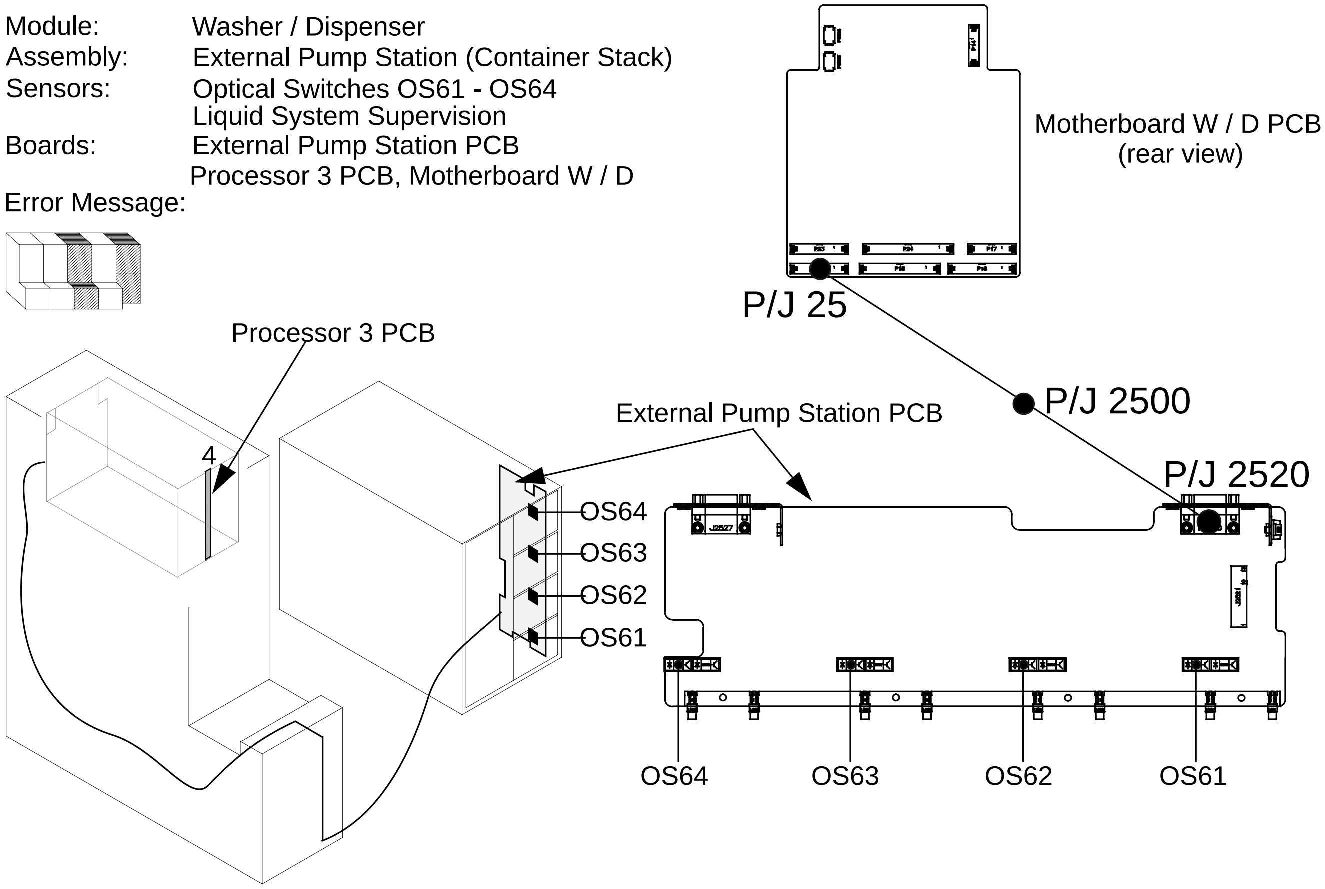
.....(...)

4.6.7 Troubleshooting

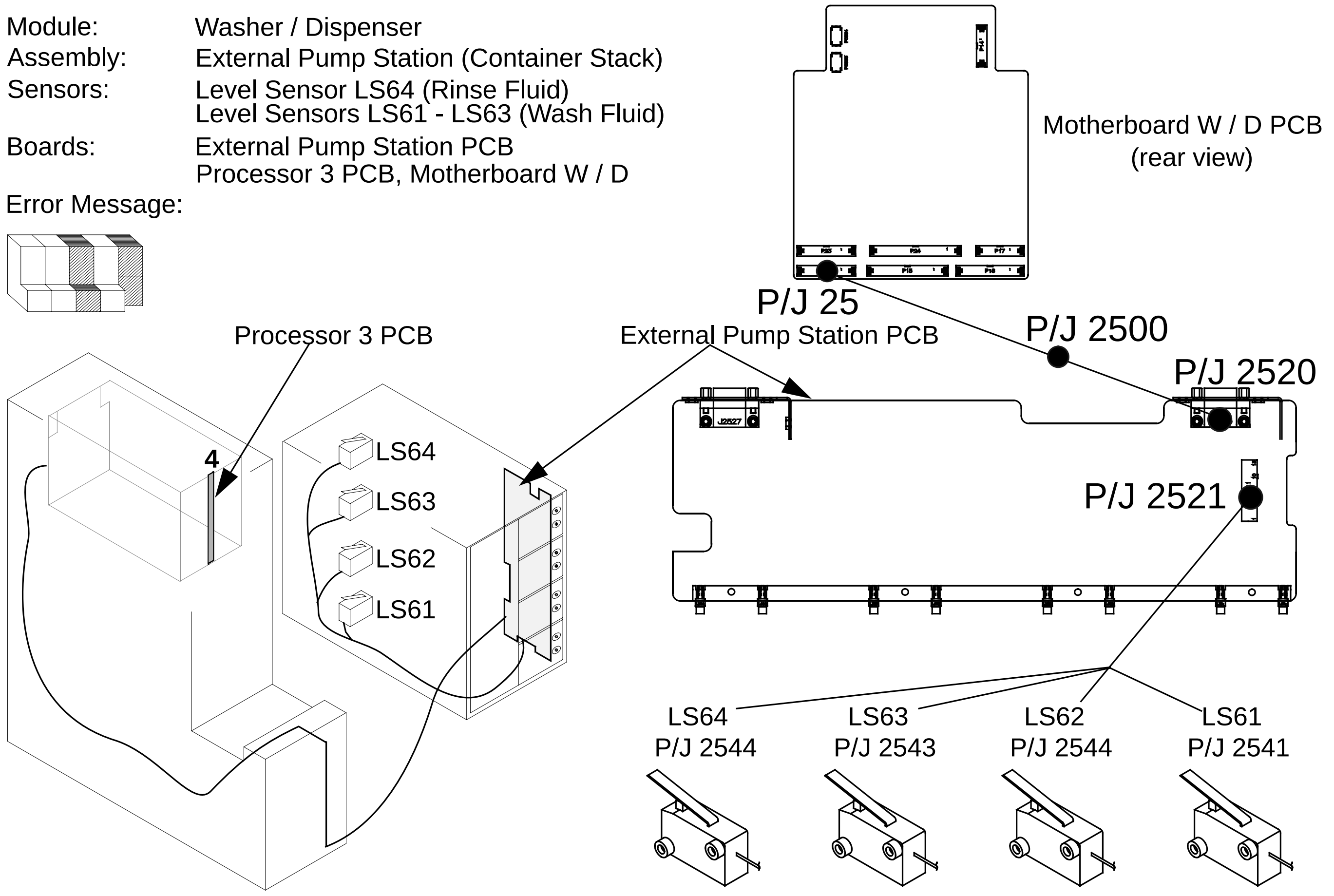
Module:	Washer / Dispenser
Assembly:	External Pump Station (Container Stack)
Actors:	Pump Motor PM64 (Rinse / Wash Fluid) Pump Motors PM61 - PM63 (Wash Fluid)
Boards:	External Pump Station PCB Processor 3 PCB, Motherboard W / D
Error Message:	


Motherboard W / D PCB
(rear view)
P/J 25
Processor 3 PCB
External Pump Station PCB
P/J 2500
4
PM64
PM63
PM62
PM61
P/J 2520
PM61
P/J 2522
PM62
P/J 2523
PM63
P/J 2524
PM64
P/J 2525

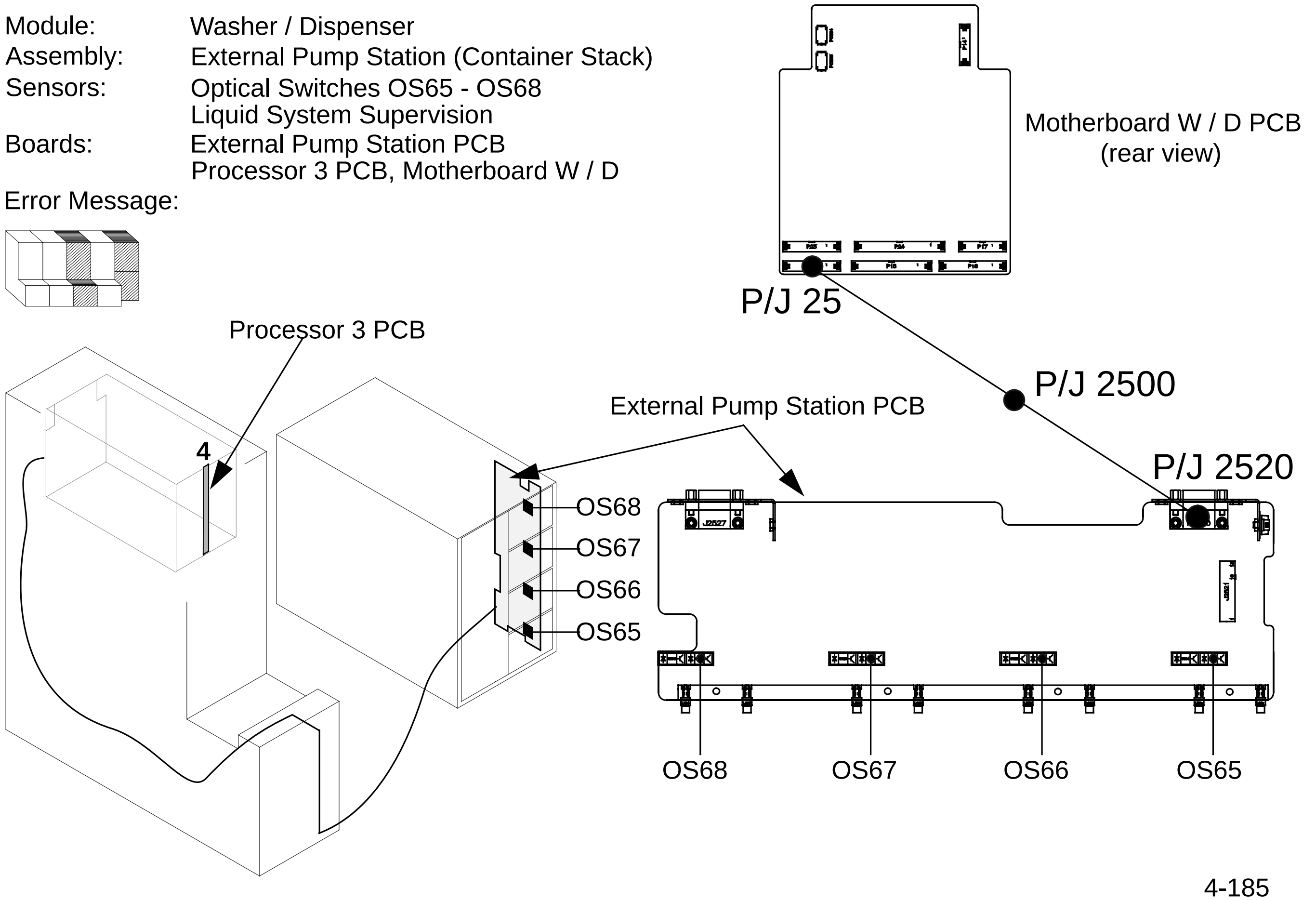
Module:	Washer / Dispenser
Assembly:	External Pump Station (Container Stack)
Sensors:	Optical Switches OS61 - OS64 Liquid System Supervision
Boards:	External Pump Station PCB Processor 3 PCB, Motherboard W / D
Error Message:	


Motherboard W / D PCB
(rear view)
P/J 25
Processor 3 PCB
P/J 2500
External Pump Station PCB
P/J 2520
4
OS64
OS63
OS62
OS61
OS64
OS63
OS62
OS61

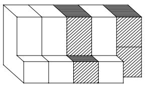
Module:	Washer / Dispenser
Assembly:	External Pump Station (Container Stack)
Sensors:	Level Sensor LS64 (Rinse Fluid) Level Sensors LS61 - LS63 (Wash Fluid)
Boards:	External Pump Station PCB Processor 3 PCB, Motherboard W / D
Error Message:	

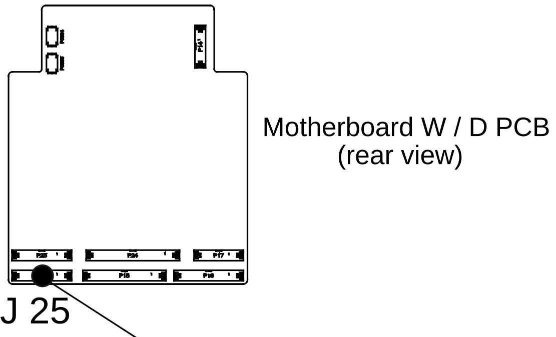

Motherboard W / D PCB
(rear view)
P/J 25
P/J 2500
P/J 2520
P/J 2521
Processor 3 PCB
External Pump Station PCB
4
LS64
LS63
LS62
LS61
J2527
LS64
P/J 2544
LS63
P/J 2543
LS62
P/J 2544
LS61
P/J 2541

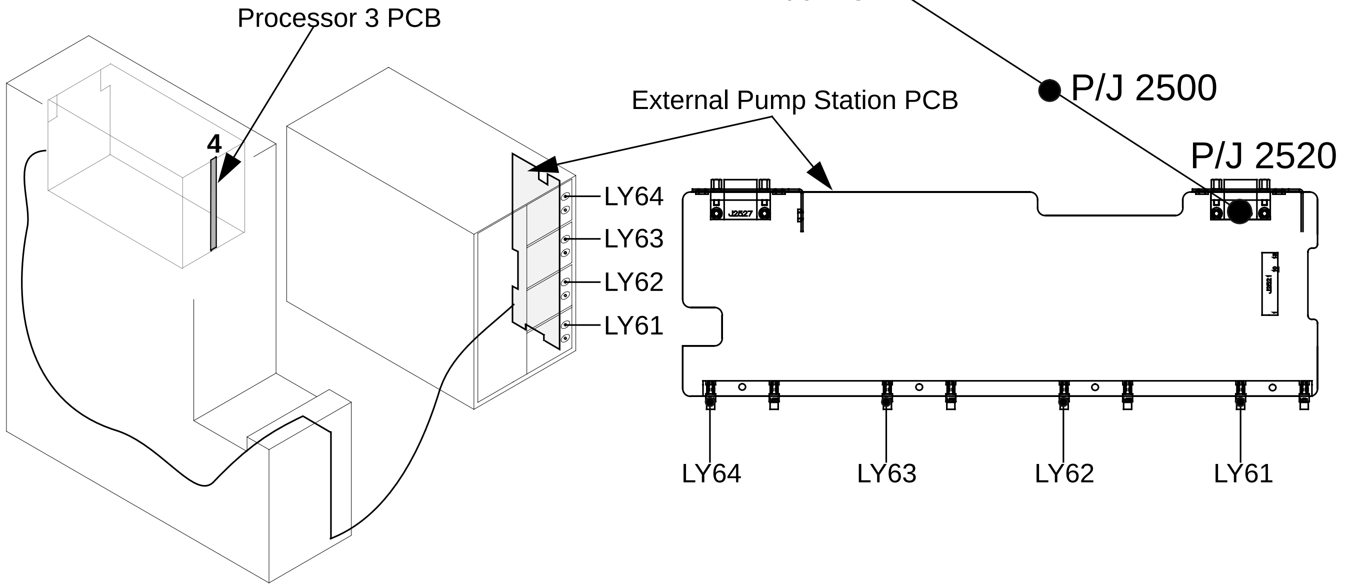
Module:	Washer / Dispenser
Assembly:	External Pump Station (Container Stack)
Sensors:	Optical Switches OS65 - OS68 Liquid System Supervision
Boards:	External Pump Station PCB Processor 3 PCB, Motherboard W / D
Error Message:	


Motherboard W / D PCB
(rear view)
P/J 25
P/J 2500
P/J 2520
Processor 3 PCB
External Pump Station PCB
4
OS68
OS67
OS66
OS65
J2527
OS68
OS67
OS66
OS65

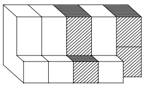
Module: Washer / Dispenser
Assembly: External Pump Station (Container Stack)
Actors: LED yellow LY61 - LY64
Liquid System Supervision
Boards: External Pump Station PCB
Processor 3 PCB, Motherboard W / D
Error Message:

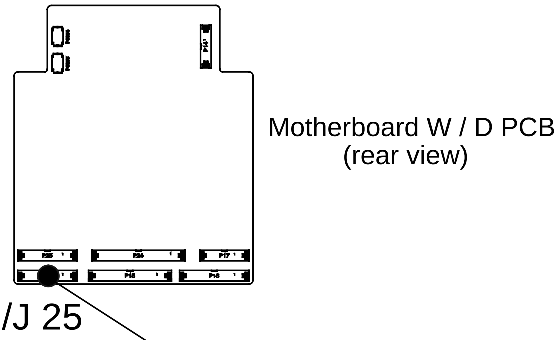


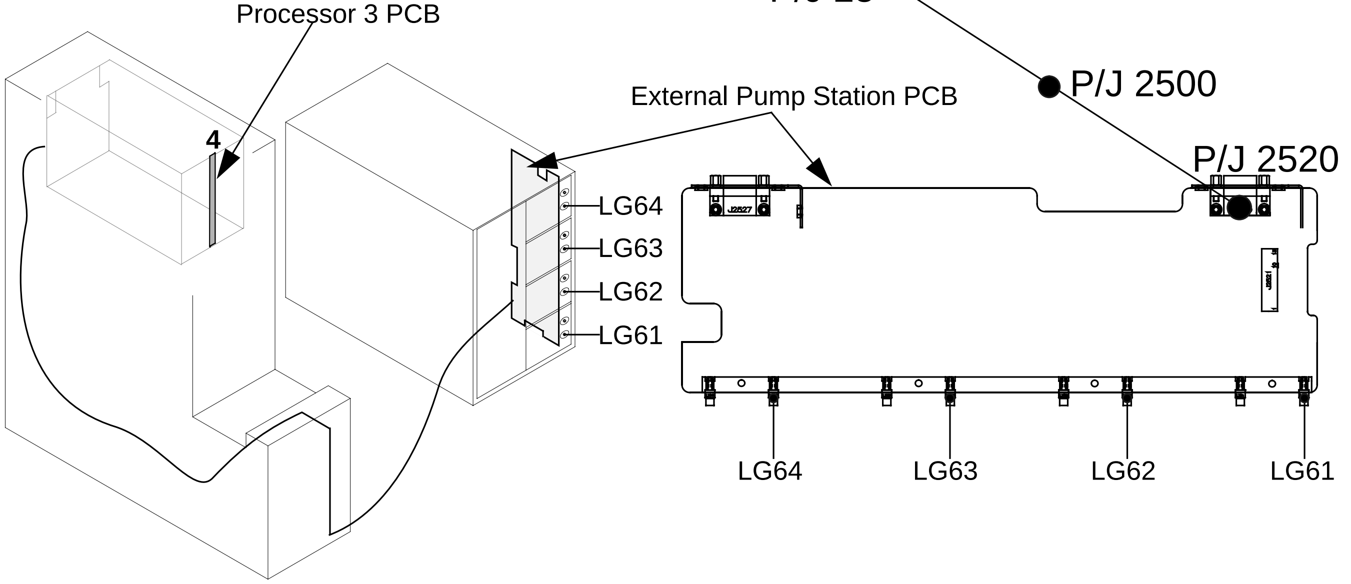

Motherboard W / D PCB
(rear view)
P/J 25


Processor 3 PCB
4
External Pump Station PCB
P/J 2500
P/J 2520
LY64
LY63
LY62
LY61
J2527
LY64
LY63
LY62
LY61

Module: Washer / Dispenser
Assembly: External Pump Station (Container Stack)
Actors: LED green LG61 - LG64
Liquid System Supervision
Boards: External Pump Station PCB
Processor 3 PCB, Motherboard W / D
Error Message:




Motherboard W / D PCB
(rear view)
P/J 25

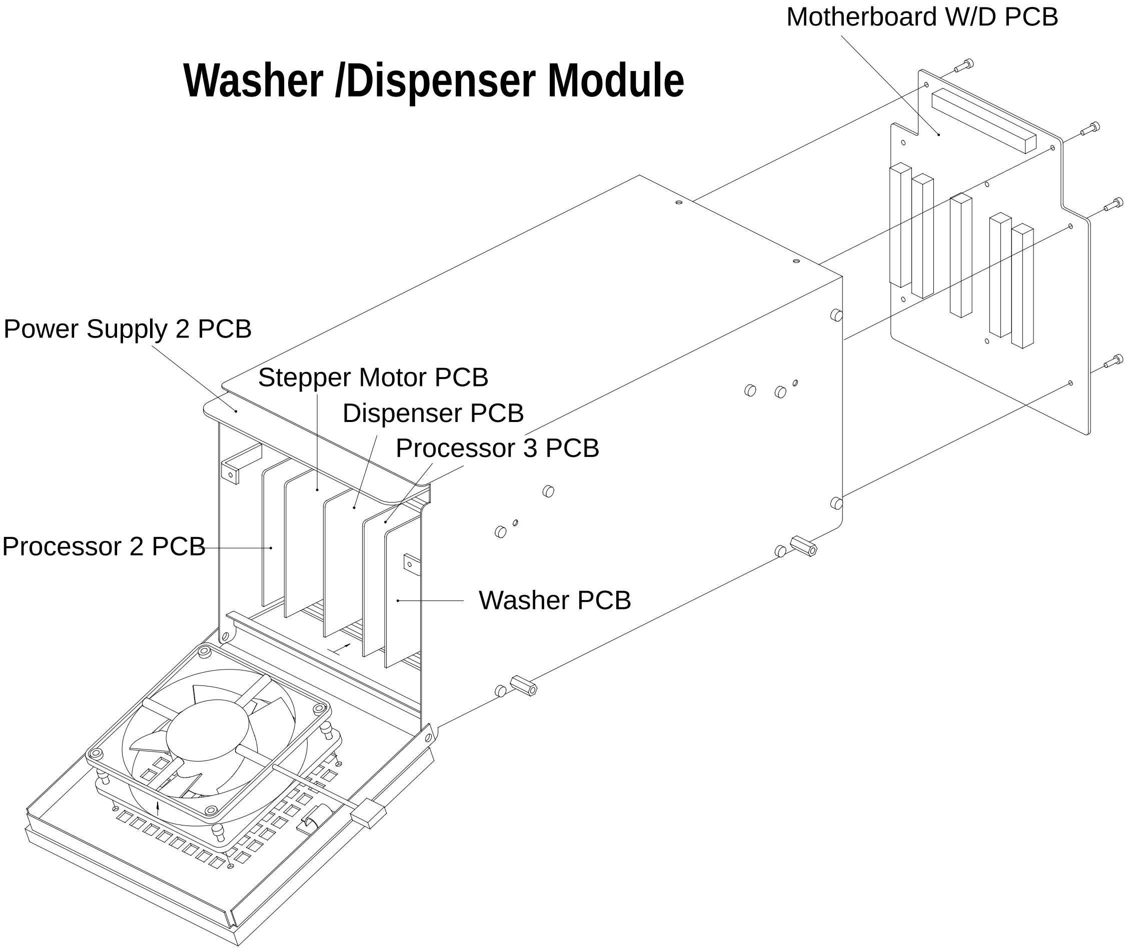

Processor 3 PCB
4
External Pump Station PCB
P/J 2500
P/J 2520
LG64
LG63
LG62
LG61
J2527
LG64
LG63
LG62
LG61

Electronic Rack

(Washer / Disp. Module)

- Motherboard W/D PCB
  146 168
- Power Supply 2 PCB
  146 172
- Processor 2 PCB
  146 162 (See Entry Elect. Rack)
- Stepper Motor PCB
  146 174 (See Entry Elect. Rack)
- Dispenser PCB
  146 180
- Processor 3 PCB
  146 163 (See Entry Elect. Rack)
- Washer PCB
  146 182

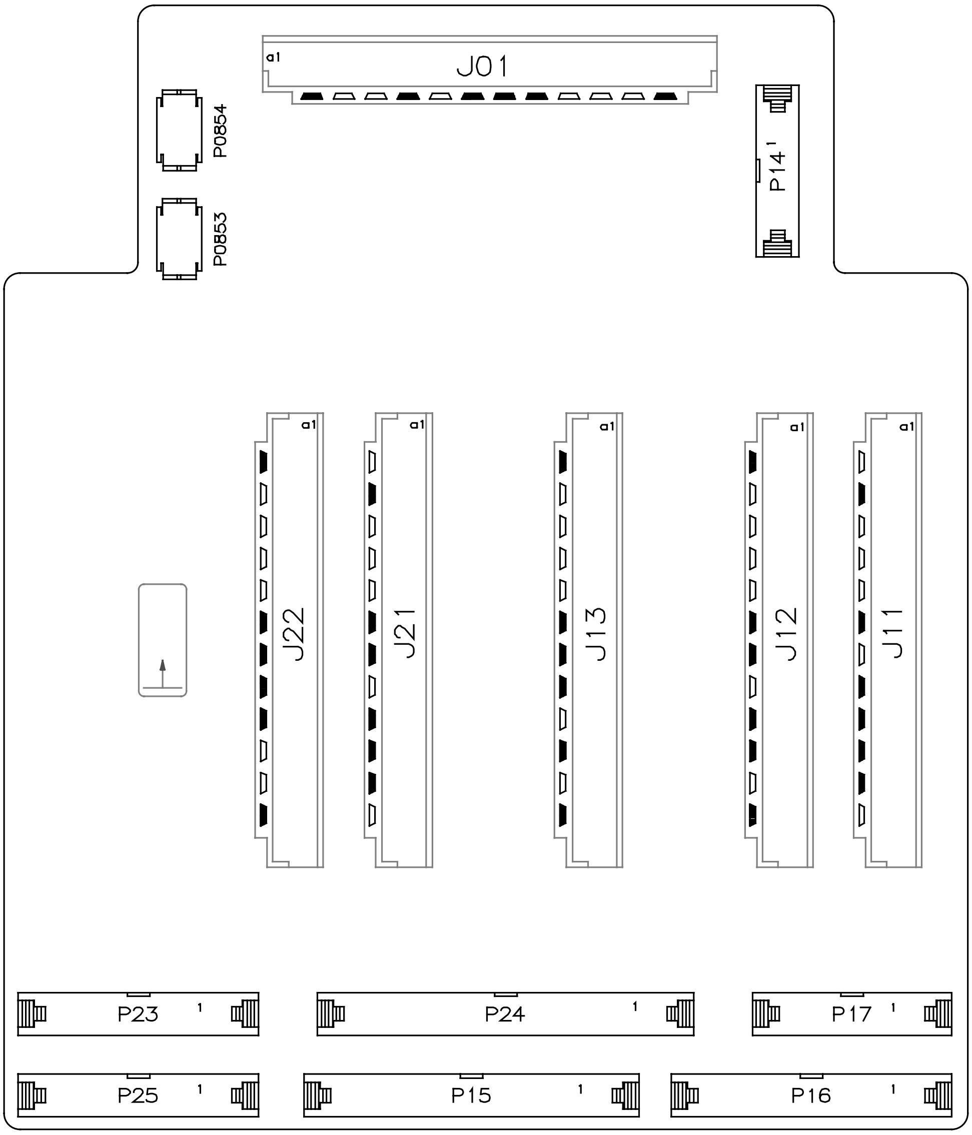
4.7 W/D Electronic Rack


Motherboard W/D PCB
Washer /Dispenser Module
Power Supply 2 PCB
Stepper Motor PCB
Dispenser PCB
Processor 3 PCB
Processor 2 PCB
Washer PCB

4.7.1 Motherboard W / D PCB p/n 146 168

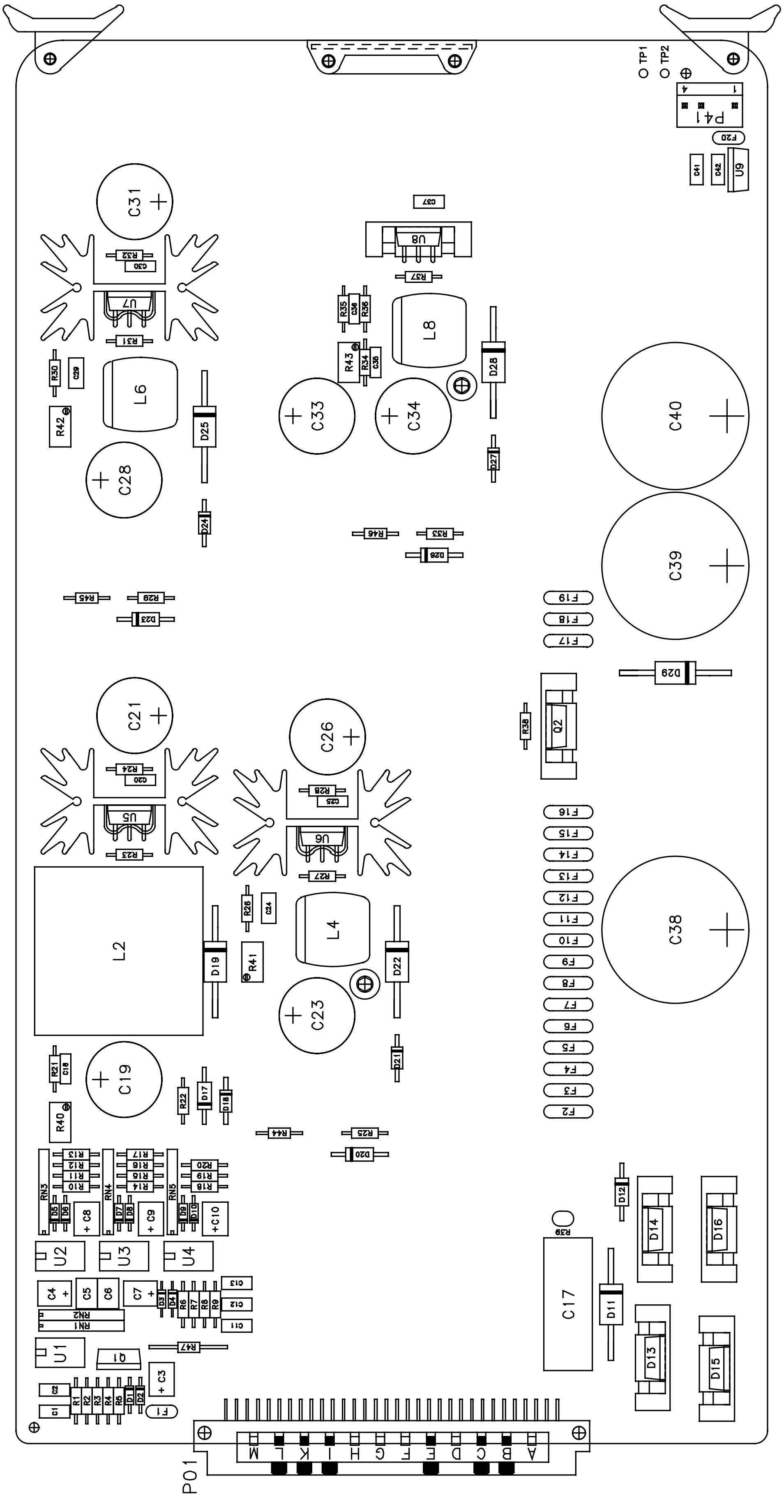
Component Layout: Dwg No. 146 168 revision 00

Rear View of PCB


J01
a1
P0854
P0853
P14
1
J22
J21
J13
J12
J11
a1
P23
P24
P17
P25
P15
P16
1

4.7.2 Power Supply 2 PCB p/n 146 172

Component Layout: Dwg No. 146 172 revision 06


TP1
TP2
P41
F20
C41
C42
U9
C37
U8
R37
C31
R32
C30
U7
R31
R35
R36
L8
R43
R34
C35
D28
R30
C29
L6
R42
D25
C33
C34
C40
D27
C28
D24
R46
R33
D26
C39
R45
R29
D23
F19
F18
F17
D29
R38
Q2
C21
R24
C20
U5
R23
C26
R28
C25
U6
R27
F16
F15
F14
F13
F12
F11
F10
F9
F8
F7
F6
F5
F4
F3
F2
C38
L2
D19
R26
C24
L4
R41
D22
C23
D21
R21
C18
C19
R22
D17
D18
R40
R44
R25
D20
R13
R12
R11
R10
RN3
D5
D6
C8
R17
R16
R15
R14
RN4
D7
D8
C9
R20
R19
R18
RN5
D9
D10
C10
U2
U3
U4
C4
C5
C6
C7
D3
D4
R6
R7
R8
R9
C13
C12
C11
RN2
RN1
U1
Q1
R47
C3
C2
C1
R1
R2
R3
R4
R5
D1
D2
F1
R39
C17
D11
D12
D14
D16
D13
D15
A B C D E F G H I K L M
P01

4.7.3 Processor 2 PCB p/n 146 162

See Entry Electronic Rack

4.7.4 Processor 3 PCB p/n 146 163

See Entry Electronic Rack.

4.7.5 Stepper Motor PCB p/n 146 174

See Entry Electronic Rack

4.7.6 Dispenser PCB p/n 146 180

FUNCTIONAL DESCRIPTION

Overview

The dispenser PCB, controlled by the microprocessor PCB of the dispenser system, operates the sensors and activators of the dispenser assembly.

There are three different groups of functions:

- ❐ Operation of 2 stepper motors (SE20 and SE30) and the monitoring of a third stepper motor.
- ❐ Operation of the transmitter and signal interpretation for level detection during aspiration of reagents out of the containers (LS27).
- ❐ Operation of additional sensors and activators, namely:
    - ❐ 2 hall sensors (HS30 and HS43) including interrupt-generation for HS43.
    - ❐ 8 Darlington drivers for control of periphery elements. Five of the drivers are designated for LED control (_OS10_11_ON, _OS20_ON, _OS26_ON, OS28_ON and _OS40_ON). The other three drivers are available for possible expansion.

Stepper Motor Control

Two stepper motors can be driven in the microstep mode. Disc-magnet stepper motors with integrated hall sensors (ESCAP PP 520-258004) are utilized. The hall sensors, together with the counter - IC HP HCTL2020, make monitoring of position and step-count possible. The stepper motor controls can also drive stepper motors without position sensors. Both operations are controlled by stepper motor SE20 (dosing Arm X - movement) and stepper motor SE30 (dosing drive). In addition to the position-sensor counters named above, an additional counter is available for position control of the reagent driver (SE40).

The stepper motor operation involves the following components:

- ❐ I/O - port 82C55A - 2: ports PB2-PB7
- ❐ Monitoring of position and step-count with the HP HCTL2020 counter
- ❐ 2 stepper motor endstages consisting of 2 D/A - converters (PM7224), 2 “full bridge drivers” L6202, and a “current controller” L6506

Liquid Level Detection

The reagent containers in the “washer/dispenser” module are liquid level controlled. The signal source and at the same time detector forms the tone-decoder NE/SE/LM 567. The detector-output of this IC changes its logical condition dependent upon the signal-amplitude and phase-amplitude of the received signals. It is lead to port PB0 of the I/O - IC 82C55-2. A change in the detection threshold or the quality of the reception signal is made possible through a steered amplifier (combination Op-Amp and D/A - converter PM7524), through which a selectable part of the transmission signal is added to reception signal. This compensating signal stands phase-locked to the transmission signal.

A variable phase displacement of the signal over the transmission line, can be balanced against the middle of a controlled phase changer (combination Op-Amp and analog switch 74HC4066).

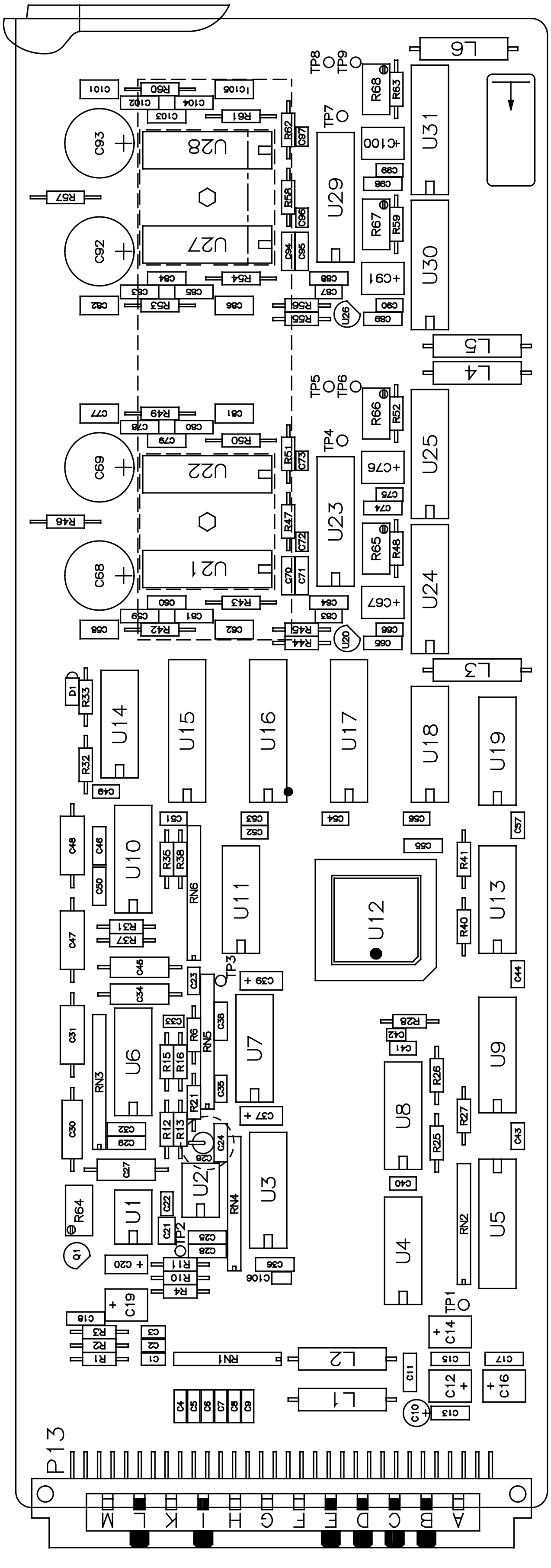
In contrast to the transmitter (signal formation and driver), which is completely integrated onto the PCB, the receiver is connected to the “connector board W1 PCB” P/N 146 180. The reception signals are produced on the dispenser PCB intermediate amplifier, signal filtering, and adder for the compensating signal. The LLD part may be switched on and off over the PC0 port of the I/O - IC 82C55A-2

Additional Sensors and Activators

Altogether, four sensors with logical outputs are read over ports PC4 and PC7 of the I/O - IC 82C55A-2. Besides the LLD output, the “init” sensors OS20 (dosing arm X-movement), HS30 (dosing drive), and the HS43 hall sensor (for the opening of the drawer) are also processed. Last-named signals are regenerated, inverted, and then lead to port ACH.7 of the microprocessor as an interrupt-signal.

Additionally, a total of 8 drivers (Darlington ULN 2308) are available for the control of LEDs for example, etc... Five of the drivers (I/O - ports PA0 ... PA4) are controlled by optical switches OS10, OS11 (OS10 and OS11 being activated by the same bit, OS20, OS26, OS28, and OS40. The three remaining drivers are available for expansion

Dispenser PCB (component layout): Dwg No. 146 180 revision 01


TP8
TP9
L6
R68
R63
C101
R60
C105
C102
C104
C103
R61
TP7
R62
C97
U28
C93
C100
U31
C99
C98
R57
R58
C96
U29
R67
R59
C92
U27
C94
C95
C91
U30
C84
R54
C88
C83
C85
C87
C82
R53
C86
R56
C90
R55
U26
C89
L5
L4
TP5
TP6
R66
R52
C77
R49
C81
C78
C80
C79
R50
TP4
R51
C73
C69
U22
C76
U25
C75
C74
R46
R47
U23
C72
R65
R48
C68
U21
C70
C71
C67
U24
C60
R43
C64
C59
C61
C63
C58
R42
C62
R45
C66
R44
U20
C65
L3
D1
R33
U14
U15
U16
U17
U18
U19
R32
C49
C51
C53
C52
C54
C56
C57
C55
C48
C46
U10
R35
R38
R41
RN6
U11
U12
U13
C50
R40
R31
R37
C47
C45
TP3
C39
C23
C44
C34
C33
C38
R28
C31
RN3
U6
R6
RN5
U7
C42
C41
R15
R16
R26
U9
C35
R21
C37
U8
R12
R13
C24
R27
C32
C29
C30
C26
R25
C43
C27
U2
U3
C40
R64
U1
C22
RN4
RN2
U5
U4
C21
TP2
C25
C28
Q1
C20
R11
C36
R10
C106
R4
TP1
C19
C18
C14
R3
C3
R2
C2
R1
C1
RN1
L2
C11
C15
C17
C12
C16
L1
C4
C5
C6
C7
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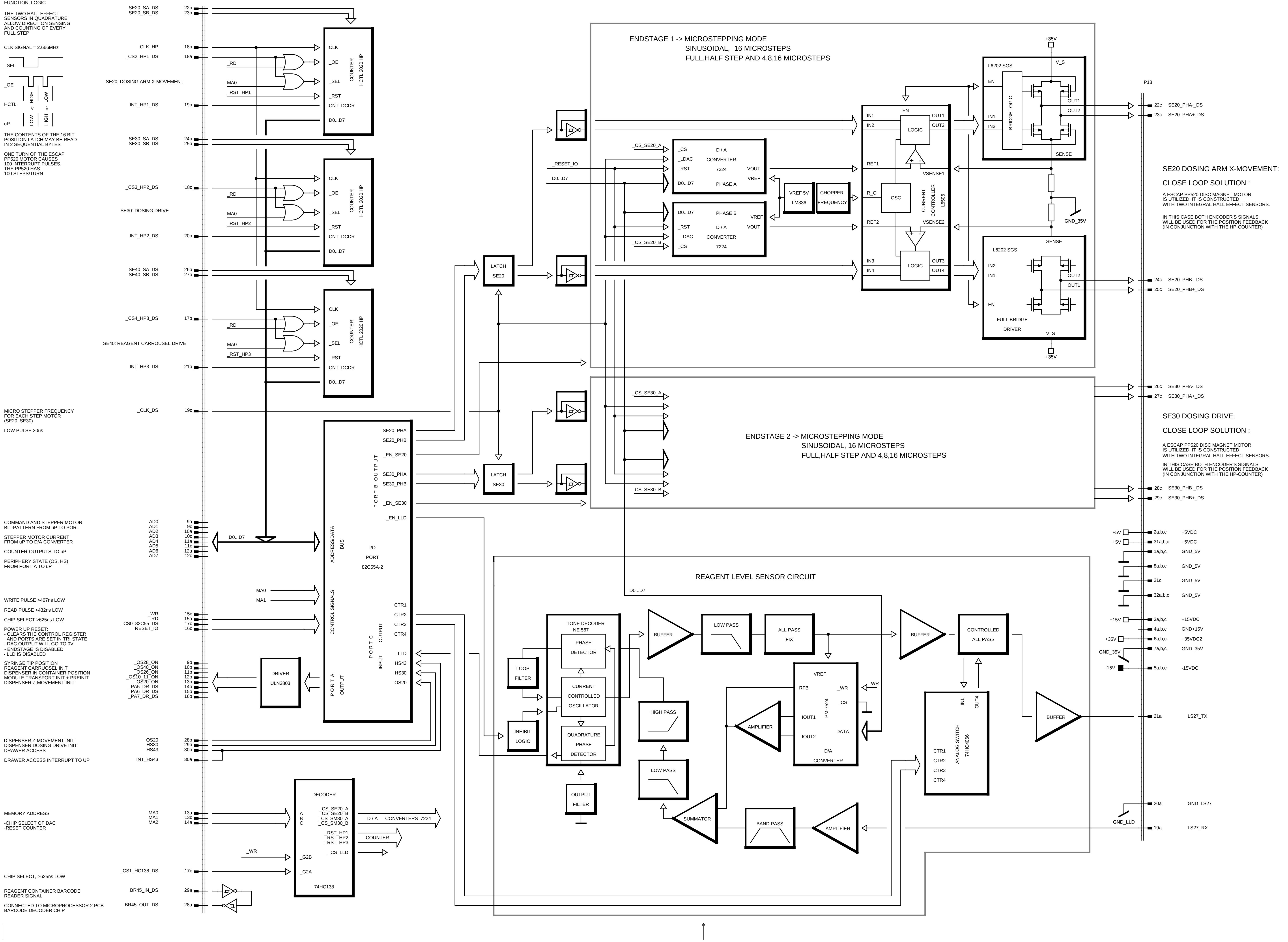
C10
C13
P13
M
L
K
I
H
G
F
E
D
C
B
A

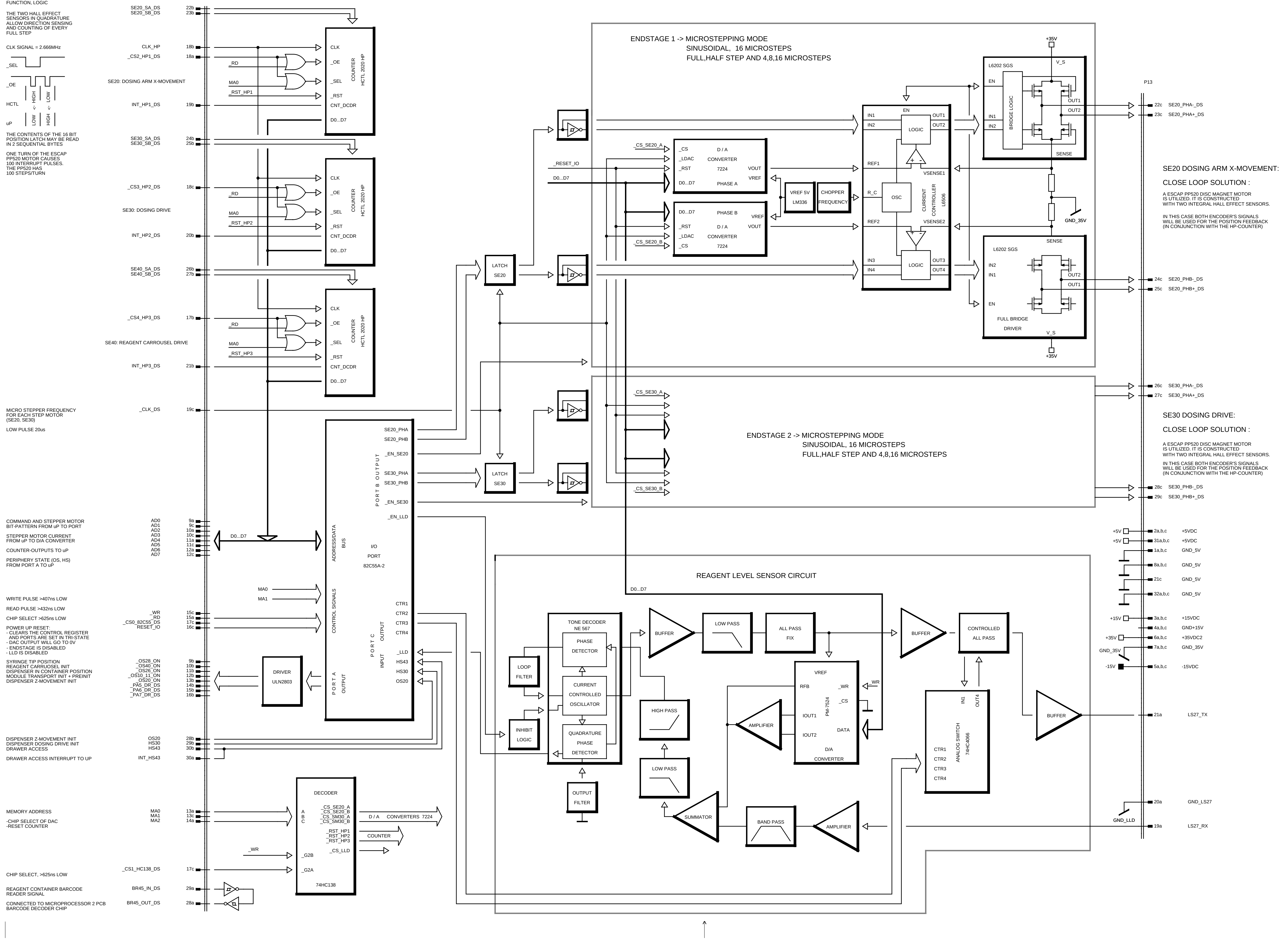

FUNCTION, LOGIC
SIGNAL
PIN
P13
THE TWO HALL EFFECT SENSORS IN QUADRATURE ALLOW DIRECTION SENSING AND COUNTING OF EVERY FULL STEP
CLK SIGNAL = 2.666MHz
_SEL
_OE
HCTL
uP
HIGH
LOW
THE CONTENTS OF THE 16 BIT POSITION LATCH MAY BE READ IN 2 SEQUENTIAL BYTES
ONE TURN OF THE ESCAP PP520 MOTOR CAUSES 100 INTERRUPT PULSES. THE PP520 HAS 100 STEPS/TURN
SE20_SA_DS 22b
SE20_SB_DS 23b
CLK_HP 18b
_CS2_HP1_DS 18a
SE20: DOSING ARM X-MOVEMENT
INT_HP1_DS 19b
SE30_SA_DS 24b
SE30_SB_DS 25b
_CS3_HP2_DS 18c
SE30: DOSING DRIVE
INT_HP2_DS 20b
SE40_SA_DS 26b
SE40_SB_DS 27b
_CS4_HP3_DS 17b
SE40: REAGENT CARROUSEL DRIVE
INT_HP3_DS 21b
_RD
MA0
_RST_HP1
_RST_HP2
_RST_HP3
CLK
_OE
_SEL
_RST
CNT_DCDR
D0...D7
COUNTER
HCTL 2020 HP
MICRO STEPPER FREQUENCY FOR EACH STEP MOTOR (SE20, SE30)
LOW PULSE 20us
_CLK_DS 19c
COMMAND AND STEPPER MOTOR BIT-PATTERN FROM uP TO PORT
STEPPER MOTOR CURRENT FROM uP TO D/A CONVERTER
COUNTER-OUTPUTS TO uP
PERIPHERY STATE (OS, HS) FROM PORT A TO uP
AD0 9a
AD1 9c
AD2 10a
AD3 10c
AD4 11a
AD5 11c
AD6 12a
AD7 12c
D0...D7
WRITE PULSE >407ns LOW
READ PULSE >432ns LOW
CHIP SELECT >625ns LOW
POWER UP RESET:
- CLEARS THE CONTROL REGISTER AND PORTS ARE SET IN TRI-STATE
- DAC OUTPUT WILL GO TO 0V
- ENDSTAGE IS DISABLED
- LLD IS DISABLED
_WR 15c
_RD 15a
_CS0_82C55_DS 17c
_RESET_IO 16c
SYRINGE TIP POSITION
REAGENT CARRUOSEL INIT
DISPENSER IN CONTAINER POSITION
MODULE TRANSPORT INIT + PREINIT
DISPENSER Z-MOVEMENT INIT
_OS28_ON 9b
_OS40_ON 10b
_OS26_ON 11b
_OS10_11_ON 12b
_OS20_ON 13b
_PA5_DR_DS 14b
_PA6_DR_DS 15b
_PA7_DR_DS 16b
DRIVER
ULN2803
DISPENSER Z-MOVEMENT INIT
DISPENSER DOSING DRIVE INIT
DRAWER ACCESS
DRAWER ACCESS INTERRUPT TO UP
OS20 28b
HS30 29b
HS43 30b
INT_HS43 30a
MA0
MA1
SE20_PHA
SE20_PHB
_EN_SE20
SE30_PHA
SE30_PHB
_EN_SE30
_EN_LLD
PORT B OUTPUT
ADDRESS/DATA BUS
I/O
PORT
82C55A-2
CONTROL SIGNALS
PORT C
OUTPUT
INPUT
CTR1
CTR2
CTR3
CTR4
_LLD
HS43
HS30
OS20
PORT A
OUTPUT
MEMORY ADDRESS
-CHIP SELECT OF DAC
-RESET COUNTER
MA0 13a
MA1 13c
MA2 14a
_WR
CHIP SELECT, >625ns LOW
_CS1_HC138_DS 17c
DECODER
A
B
C
_G2B
_G2A
74HC138
_CS_SE20_A
_CS_SE20_B
_CS_SM30_A
_CS_SM30_B
_RST_HP1
_RST_HP2
_RST_HP3
_CS_LLD
D / A CONVERTERS 7224
COUNTER
REAGENT CONTAINER BARCODE READER SIGNAL
BR45_IN_DS 29a
CONNECTED TO MICROPROCESSOR 2 PCB BARCODE DECODER CHIP
BR45_OUT_DS 28a
LATCH
SE20
LATCH
SE30
ENDSTAGE 1 -> MICROSTEPPING MODE
SINUSOIDAL, 16 MICROSTEPS
FULL,HALF STEP AND 4,8,16 MICROSTEPS
_RESET_IO
D0...D7
_CS_SE20_A
_CS
_LDAC
_RST
D / A
CONVERTER
7224
VOUT
VREF
PHASE A
PHASE B
_CS_SE20_B
VREF 5V
LM336
CHOPPER
FREQUENCY
IN1
IN2
EN
LOGIC
OUT1
OUT2
REF1
VSENSE1
R_C
OSC
CURRENT CONTROLLER
L6506
REF2
VSENSE2
IN3
IN4
OUT3
OUT4
+35V
L6202 SGS
V_S
BRIDGE LOGIC
SENSE
GND_35V
FULL BRIDGE
DRIVER
P13
22c SE20_PHA-_DS
23c SE20_PHA+_DS
24c SE20_PHB-_DS
25c SE20_PHB+_DS
SE20 DOSING ARM X-MOVEMENT:
CLOSE LOOP SOLUTION :
A ESCAP PP520 DISC MAGNET MOTOR IS UTILIZED. IT IS CONSTRUCTED WITH TWO INTEGRAL HALL EFFECT SENSORS.
IN THIS CASE BOTH ENCODER'S SIGNALS WILL BE USED FOR THE POSITION FEEDBACK (IN CONJUNCTION WITH THE HP-COUNTER)
_CS_SE30_A
_CS_SE30_B
ENDSTAGE 2 -> MICROSTEPPING MODE
SINUSOIDAL, 16 MICROSTEPS
FULL,HALF STEP AND 4,8,16 MICROSTEPS
26c SE30_PHA-_DS
27c SE30_PHA+_DS
28c SE30_PHB-_DS
29c SE30_PHB+_DS
SE30 DOSING DRIVE:
CLOSE LOOP SOLUTION :
A ESCAP PP520 DISC MAGNET MOTOR IS UTILIZED. IT IS CONSTRUCTED WITH TWO INTEGRAL HALL EFFECT SENSORS.
IN THIS CASE BOTH ENCODER'S SIGNALS WILL BE USED FOR THE POSITION FEEDBACK (IN CONJUNCTION WITH THE HP-COUNTER)
+5V 2a,b,c +5VDC
+5V 31a,b,c +5VDC
1a,b,c GND_5V
8a,b,c GND_5V
21c GND_5V
32a,b,c GND_5V
+15V 3a,b,c +15VDC
4a,b,c GND+15V
+35V 6a,b,c +35VDC2
GND_35V 7a,b,c GND_35V
-15V 5a,b,c -15VDC
REAGENT LEVEL SENSOR CIRCUIT
D0...D7
TONE DECODER
NE 567
PHASE
DETECTOR
CURRENT
CONTROLLED
OSCILLATOR
QUADRATURE
PHASE
DETECTOR
LOOP
FILTER
INHIBIT
LOGIC
OUTPUT
FILTER
BUFFER
LOW PASS
ALL PASS
FIX
HIGH PASS
AMPLIFIER
LOW PASS
SUMMATOR
BAND PASS
AMPLIFIER
VREF
RFB
_WR
_CS
IOUT1
IOUT2
DATA
PM-7524
D/A
CONVERTER
BUFFER
CONTROLLED
ALL PASS
IN1
OUT4
ANALOG SWITCH
74HC4066
CTR1
CTR2
CTR3
CTR4
BUFFER
21a LS27_TX
20a GND_LS27
GND_LLD
19a LS27_RX

Block Diagram Dispenser PCB

614.125 revision 00

Block Diagram Dispenser PCB

614.125 revision 00


SIGNAL
PIN
P13
SE20_SA_DS 22b
SE20_SB_DS 23b
CLK_HP 18b
_CS2_HP1_DS 18a
SE20: DOSING ARM X-MOVEMENT
INT_HP1_DS 19b
SE30_SA_DS 24b
SE30_SB_DS 25b
_CS3_HP2_DS 18c
SE30: DOSING DRIVE
INT_HP2_DS 20b
SE40_SA_DS 26b
SE40_SB_DS 27b
_CS4_HP3_DS 17b
SE40: REAGENT CARROUSEL DRIVE
INT_HP3_DS 21b
_CLK_DS 19c
AD0 9a
AD1 9c
AD2 10a
AD3 10c
AD4 11a
AD5 11c
AD6 12a
AD7 12c
_WR 15c
_RD 15a
_CS0_82C55_DS 17c
RESET_IO 16c
_OS28_ON 9b
_OS40_ON 10b
_OS26_ON 11b
_OS10_11_ON 12b
_OS20_ON 13b
_PA5_DR_DS 14b
_PA6_DR_DS 15b
_PA7_DR_DS 16b
OS20 28b
HS30 29b
HS43 30b
INT_HS43 30a
MA0 13a
MA1 13c
MA2 14a
_CS1_HC138_DS 17c
BR45_IN_DS 29a
BR45_OUT_DS 28a
_SEL
_OE
HCTL
uP
HIGH
LOW
<-
_RD
MA0
_RST_HP1
_RST_HP2
_RST_HP3
CLK
_OE
_SEL
_RST
CNT_DCDR
D0...D7
COUNTER
HCTL 2020 HP
I/O
PORT
82C55A-2
ADDRESS/DATA
BUS
CONTROL SIGNALS
PORT B OUTPUT
PORT C
OUTPUT
INPUT
PORT A
OUTPUT
SE20_PHA
SE20_PHB
_EN_SE20
SE30_PHA
SE30_PHB
_EN_SE30
_EN_LLD
CTR1
CTR2
CTR3
CTR4
_LLD
HS43
HS30
OS20
MA0
MA1
D0...D7
DRIVER
ULN2803
DECODER
A
B
C
_CS_SE20_A
_CS_SE20_B
_CS_SM30_A
_CS_SM30_B
_RST_HP1
_RST_HP2
_RST_HP3
_CS_LLD
_G2B
_G2A
74HC138
_WR
D / A CONVERTERS 7224
COUNTER
LATCH
SE20
LATCH
SE30
ENDSTAGE 1 -> MICROSTEPPING MODE
SINUSOIDAL, 16 MICROSTEPS
FULL,HALF STEP AND 4,8,16 MICROSTEPS
_CS_SE20_A
_RESET_IO
D0...D7
_CS_SE20_B
_CS
_LDAC
_RST
D0...D7
D / A
CONVERTER
7224
PHASE A
PHASE B
VOUT
VREF
VREF 5V
LM336
CHOPPER
FREQUENCY
IN1
IN2
IN3
IN4
EN
LOGIC
OUT1
OUT2
OUT3
OUT4
REF1
REF2
R_C
OSC
VSENSE1
VSENSE2
CURRENT
CONTROLLER
L6506
+35V
L6202 SGS
V_S
BRIDGE LOGIC
SENSE
GND_35V
FULL BRIDGE
DRIVER
ENDSTAGE 2 -> MICROSTEPPING MODE
SINUSOIDAL, 16 MICROSTEPS
FULL,HALF STEP AND 4,8,16 MICROSTEPS
_CS_SE30_A
_CS_SE30_B
REAGENT LEVEL SENSOR CIRCUIT
D0...D7
TONE DECODER
NE 567
PHASE
DETECTOR
CURRENT
CONTROLLED
OSCILLATOR
QUADRATURE
PHASE
DETECTOR
LOOP
FILTER
INHIBIT
LOGIC
OUTPUT
FILTER
BUFFER
LOW PASS
ALL PASS
FIX
CONTROLLED
ALL PASS
HIGH PASS
AMPLIFIER
VREF
RFB
IOUT1
IOUT2
_WR
_CS
DATA
PM-7524
D/A
CONVERTER
ANALOG SWITCH
74HC4066
IN1
OUT4
CTR1
CTR2
CTR3
CTR4
SUMMATOR
BAND PASS
P13
22c SE20_PHA-_DS
23c SE20_PHA+_DS
24c SE20_PHB-_DS
25c SE20_PHB+_DS
26c SE30_PHA-_DS
27c SE30_PHA+_DS
28c SE30_PHB-_DS
29c SE30_PHB+_DS
+5V 2a,b,c +5VDC
+5V 31a,b,c +5VDC
1a,b,c GND_5V
8a,b,c GND_5V
21c GND_5V
32a,b,c GND_5V
+15V 3a,b,c +15VDC
4a,b,c GND+15V
+35V 6a,b,c +35VDC2
GND_35V 7a,b,c GND_35V
-15V 5a,b,c -15VDC
21a LS27_TX
20a GND_LS27
GND_LLD
19a LS27_RX

FUNCTION, LOGIC

THE TWO HALL EFFECT SENSORS IN QUADRATURE ALLOW DIRECTION SENSING AND COUNTING OF EVERY FULL STEP

CLK SIGNAL = 2.666MHz

THE CONTENTS OF THE 16 BIT POSITION LATCH MAY BE READ IN 2 SEQUENTIAL BYTES

ONE TURN OF THE ESCAP PP520 MOTOR CAUSES 100 INTERRUPT PULSES. THE PP520 HAS 100 STEPS/TURN

MICRO STEPPER FREQUENCY FOR EACH STEP MOTOR (SE20, SE30)

LOW PULSE 20us

COMMAND AND STEPPER MOTOR BIT-PATTERN FROM uP TO PORT

STEPPER MOTOR CURRENT FROM uP TO D/A CONVERTER

COUNTER-OUTPUTS TO uP

PERIPHERY STATE (OS, HS) FROM PORT A TO uP

WRITE PULSE >407ns LOW

READ PULSE >432ns LOW

CHIP SELECT >625ns LOW

POWER UP RESET:
- CLEARS THE CONTROL REGISTER AND PORTS ARE SET IN TRI-STATE
- DAC OUTPUT WILL GO TO 0V
- ENDSTAGE IS DISABLED
- LLD IS DISABLED

SYRINGE TIP POSITION
REAGENT CARRUOSEL INIT
DISPENSER IN CONTAINER POSITION
MODULE TRANSPORT INIT + PREINIT
DISPENSER Z-MOVEMENT INIT

DISPENSER Z-MOVEMENT INIT
DISPENSER DOSING DRIVE INIT
DRAWER ACCESS

DRAWER ACCESS INTERRUPT TO UP

MEMORY ADDRESS

-CHIP SELECT OF DAC
-RESET COUNTER

CHIP SELECT, >625ns LOW

REAGENT CONTAINER BARCODE READER SIGNAL

CONNECTED TO MICROPROCESSOR 2 PCB BARCODE DECODER CHIP

SE20 DOSING ARM X-MOVEMENT:

CLOSE LOOP SOLUTION :

A ESCAP PP520 DISC MAGNET MOTOR IS UTILIZED. IT IS CONSTRUCTED WITH TWO INTEGRAL HALL EFFECT SENSORS.

IN THIS CASE BOTH ENCODER'S SIGNALS WILL BE USED FOR THE POSITION FEEDBACK (IN CONJUNCTION WITH THE HP-COUNTER)

SE30 DOSING DRIVE:

CLOSE LOOP SOLUTION :

A ESCAP PP520 DISC MAGNET MOTOR IS UTILIZED. IT IS CONSTRUCTED WITH TWO INTEGRAL HALL EFFECT SENSORS.

IN THIS CASE BOTH ENCODER'S SIGNALS WILL BE USED FOR THE POSITION FEEDBACK (IN CONJUNCTION WITH THE HP-COUNTER)

4.7.7 Washer PCB p/n 146 182

FUNCTIONAL DESCRIPTION

Overview

The washer PCB, controlled by the microprocessor PCB of the washer system, provides the functions to operate the sensors and activators of the washer assembly.

There are four different groups of functions:

- ❐ Operation of stepper motor SM50 for the washer lift.
- ❐ Operation of the transmitter and signal processing for the level detection of the 24-channel washer manifold (LS 71-78, 81-88, 91-98), and for the waste cut-off (LS70, LS80).
- ❐ Operation and regulation of a membrane pump (PM70) and an oscillator pump (PM80). Additionally, a dosage-solenoid-valve (VA68) is operated.
- ❐ Operation of additional sensors, namely:
  - ❐ 4 fork optical switches (OS50, OS51, OS69, and OS99)
  - ❐ 2 fluid detectors (LS68 and LS99)

In addition, a digital input is available for expansion possibilities (FREE_IN_WA).

Firmware information:

The HSO2 of the microprocessor PCB is used for pump operation software-wise and can no longer be used hardware-wise.

Stepper Motor Control

Stepper motor control is in accordance with the conception and the production of the stepper motor PCB P/N 146 174. One stepper motor can be driven in the microstep mode. The operation is controlled by stepper motor SM50 (washer lift Z-movement).

Stepper motor operation involves the following components:

- ❐ I/O-port 82C55A-2: ports PC1-PC3
- ❐ Stepper-motor end stage, each involves 2 D/A - converters (PM7224), 2 “full bridge drivers” L6202, and a “current controller” L6506.
- ❐ Latch 74HC75 to synchronize the I/O port 82C55A-2 with the D/A - converters.
- ❐ OR 74HC32 as connector between _WR and _CS2_SM50_A, and between _WR and _CS3_SM50_B.

Pump Operation

Two pump controllers allow the operation of a membrane pump (PM70) and an oscillator pump (PM80). The operations are limited to a maximum current of 2.5A. The load is driven in the “sink-mode” and finds itself in the switched off condition with a potential function of typically 35V (27V to 48V). The operation or regulation is carried out via software over the puls-width outputs of the microprocessor 80KC196. The current intensity in the load circuit is measured through a precision resistance measurement between the source of the switch-FET’s and the ground, in which the worth of the result time of the FET’s is periodically saved over a sample-and-hold section. This section is self-operated over the puls-width signal.

To guarantee operation safety, both operations are taken care of by a “watchdog”-concept. A controlled switching off of the pumps is carried out during a software crash. The pumps are also switched off during a reset (RESET_IO).

Solenoid-Valve Driver

A solenoid valve (VA68) is used to pipette washing fluid. The solenoid-valve is driven in the “sink-mode” with a voltage of 24V. The on and off switching of the solenoid valve occurs over the CAN port of the washer microprocessor system (port PC1.2). The solenoid valve is switched off during a periphery reset (RESET_IO).

Liquid Level Detection (LLD)

The MTP wells are liquid level controlled. The signal source and at the same time detector forms the tone-decoder NE/SE/LM 567. The detector-output of this IC changes its logical condition dependent upon the signal-amplitude and phase-amplitude of the received signals. It is lead to port PB0 of the I/O - IC 82C55-2. A change in the detection threshold or the quality of the reception signal is made possible through a steered amplifier (combination Op-Amp and D/A - converter PM7524), through which a selectable part of the transmission signal is added to reception signal. This compensating signal remains phase-locked to the transmission signal.

A variable phase displacement of the signal over the transmission line, as well as the phase dispersion of the afflicted tolerance filter on the PCB can be balanced against the middle of a controlled phase changer (combination Op-Amp and analog switch 74HC4066).

Parts of the LLD system are not stored on the washer PCB to ensure interference-security and to remain functional. With regards to the transmitter, only the signal formation is found on the washer PCB. Parts of the transmitter (channel selection and drivers) are found on the “connectorboard W14 PCB” P/N 146 236; parts of the receiver (first pre-amplifier, impedance transformation, and channel selection) are found on the “connectorboard W13 PCB” P/N 146 234. The reception signals are realized on the washer PCB intermediate amplifier, signal filtering, and adder for the compensating signal. The LLD part may be switched on and off over the PC0 port of the I/O - IC 82C55A-2.

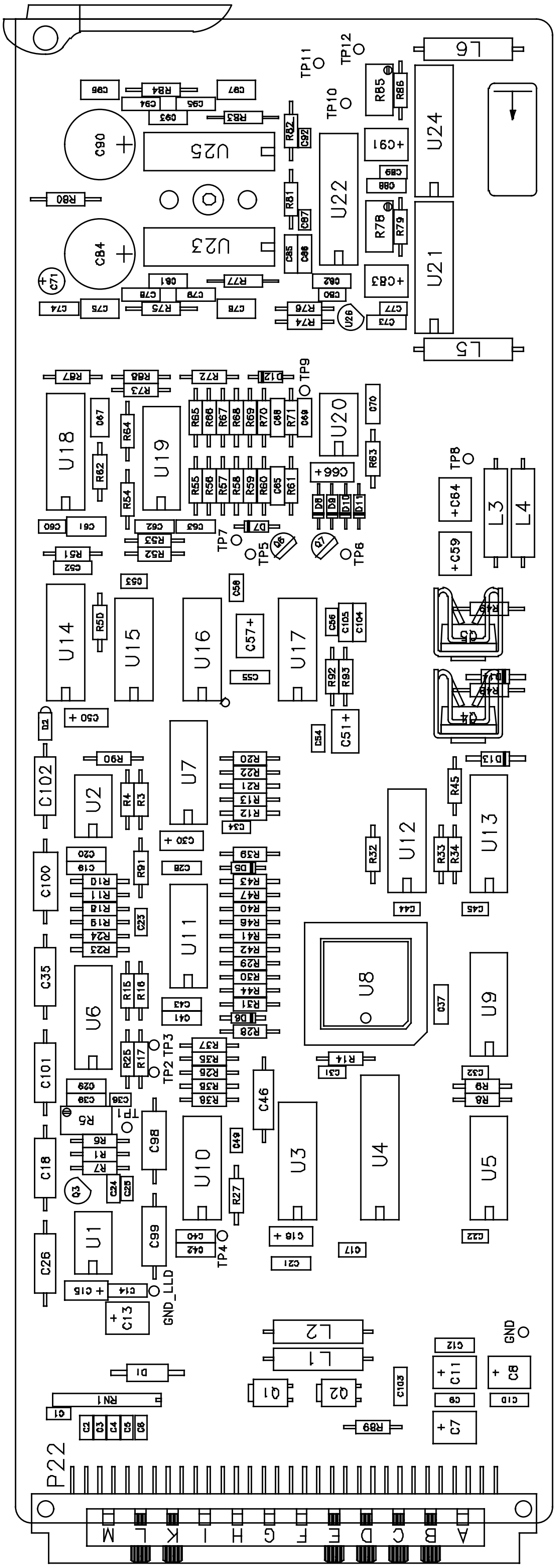
Sensors

Altogether, seven sensors with logical outputs are read over ports PB0 and PB6 of the I/O - IC 82C55A-2. Besides the LLD outputs, the following sensors are also processed: “init” sensor OS50, “Masstab” sensor OS51, wash-shell oscillating sensor OS69, fluid sensor LS68 (wash shell overflow), fluid sensor LS99 (waste container overflow), and the waste container lid OS99. Sensors OS50, OS51, and OS69 are switched on and off at the same time over the I/O - port 74HC573 (Q8). Sensor OS99 is switched on and off over the CAN - port PC1.3 (DR3) on the microprocessor PCB.

Refer to the drawing on the following page:

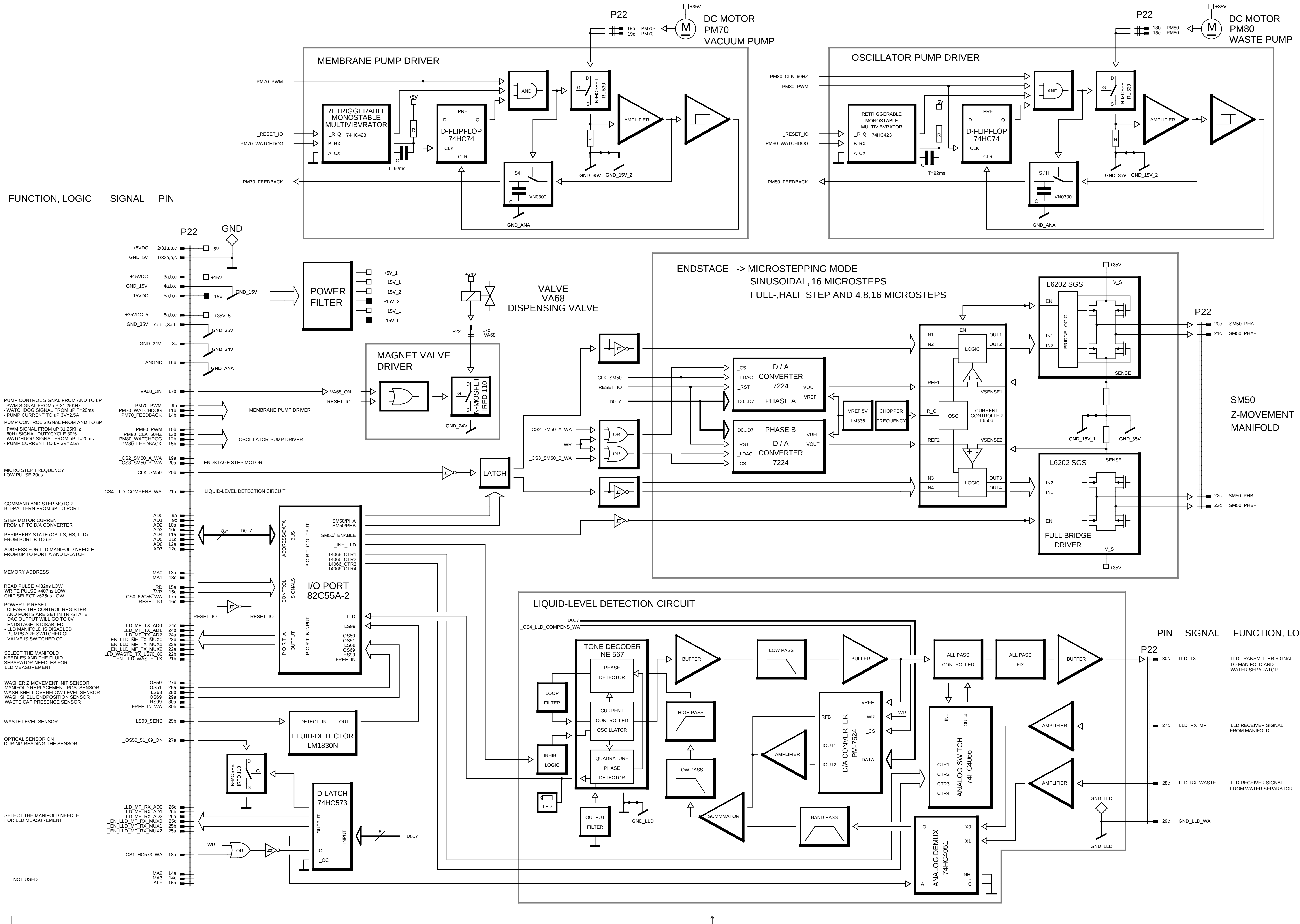
Washer PCB (component layout): Dwg No. 146 182

Washer PCB (component layout): Dwg No. 146 182 revision 04


TP11
TP12
TP10
L6
R85
R86
U24
C85
RB4
C87
C94
C95
C93
RB3
R82
C92
C90
U25
+C91
C89
C88
U22
R80
R81
C87
R78
R79
C84
U23
C85
C86
U21
C71
C81
R77
C82
+C83
C78
C79
C80
C74
C75
R75
C76
R76
R74
U26
C77
C73
L5
R87
R88
R72
D12
TP9
R73
U18
C67
R64
U19
R65
R66
R67
R68
R69
R70
C68
R71
C69
U20
C70
R62
R54
R55
R56
R57
R58
R59
R60
C65
R61
C66+
R63
TP8
D8
D9
D10
D11
+C64
L3
L4
C60
C61
C62
C63
D7
R53
R52
R51
C52
TP7
TP5
Q6
Q7
TP6
+C59
C53
C58
U14
R50
U15
U16
C57+
U17
C56
C105
C104
R48
Q5
C55
R92
R93
R49
R47
Q4
D2
C50 +
C54
C51+
D13
R90
R45
C102
U2
R4
R3
U7
R20
R22
R21
R13
R12
C34
U12
R32
R33
R34
U13
C30 +
C20
C19
R91
C28
R39
D5
C100
R10
R11
R18
R19
R24
R23
C23
U11
R43
R47
R40
R46
R41
R42
R29
R30
R44
R31
D6
R28
C44
C45
U8
C37
U9
C35
U6
R15
R16
C43
C41
C101
R25
R17
TP2
TP3
R37
R35
R26
R36
R38
C46
R14
C31
C32
R9
R8
C29
C39
C36
R5
TP1
C98
C49
U3
U4
U5
U10
C18
R6
R1
R7
R27
Q3
C24
C25
U1
C99
C40
C42
TP4
C16 +
C17
C22
C26
C21
+ C15
C14
+ C13
GND_LLD
L2
GND
C12
L1
+ C11
+ C8
D1
Q1
Q2
C103
RN1
C9
C10
C1
C2
C3
C4
C5
C6
R89
+ C7
P22
A
B
C
D
E
F
G
H
I
K
L
M

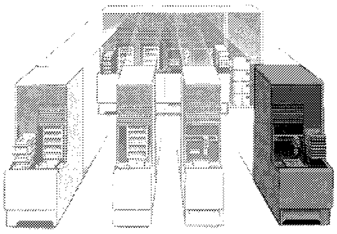
Refer to the drawing on the following page:

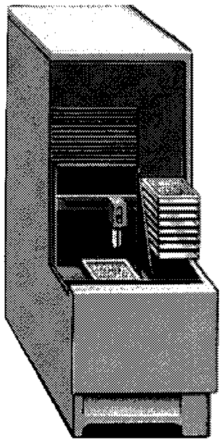
Washer PCB (block diagram): Dwg No. 614 126


P22
DC MOTOR
PM70
VACUUM PUMP
19b PM70-
19c PM70-
+35V
MEMBRANE PUMP DRIVER
PM70_PWM
_RESET_IO
PM70_WATCHDOG
PM70_FEEDBACK
RETRIGGERABLE MONOSTABLE MULTIVIBVRATOR
_R Q 74HC423
B RX
A CX
C
T=92ms
+5V
R
D-FLIPFLOP 74HC74
_PRE
D Q
CLK
_CLR
AND
N-MOSFET IRL 530
D G S
AMPLIFIER
S/H
VN0300
GND_35V
GND_15V_2
GND_ANA
DC MOTOR
PM80
WASTE PUMP
18b PM80-
18c PM80-
OSCILLATOR-PUMP DRIVER
PM80_CLK_60HZ
PM80_PWM
PM80_WATCHDOG
PM80_FEEDBACK
FUNCTION, LOGIC
SIGNAL
PIN
GND
+5VDC 2/31a,b,c
GND_5V 1/32a,b,c
+15VDC 3a,b,c
GND_15V 4a,b,c
-15VDC 5a,b,c
+35VDC_5 6a,b,c
GND_35V 7a,b,c;8a,b
GND_24V 8c
ANGND 16b
VA68_ON 17b
+5V
+15V
-15V
+35V_5
GND_15V
GND_35V
GND_24V
GND_ANA
POWER FILTER
+5V_1
+15V_1
+15V_2
-15V_2
+15V_L
-15V_L
+24V
P22
17c VA68-
VALVE VA68 DISPENSING VALVE
MAGNET VALVE DRIVER
VA68_ON
RESET_IO
N-MOSFET IRFD 110
GND_24V
PUMP CONTROL SIGNAL FROM AND TO uP
- PWM SIGNAL FROM uP 31.25KHz
- WATCHDOG SIGNAL FROM uP T=20ms
- PUMP CURRENT TO uP 3V=2.5A
PM70_PWM 9b
PM70_WATCHDOG 11b
PM70_FEEDBACK 14b
MEMBRANE-PUMP DRIVER
PUMP CONTROL SIGNAL FROM AND TO uP
- PWM SIGNAL FROM uP 31.25KHz
- 60Hz SIGNAL DUTYCYCLE 30%
- WATCHDOG SIGNAL FROM uP T=20ms
- PUMP CURRENT TO uP 3V=2.5A
PM80_PWM 10b
PM80_CLK_60HZ 13b
PM80_WATCHDOG 12b
PM80_FEEDBACK 15b
OSCILLATOR-PUMP DRIVER
_CS2_SM50_A_WA 19a
_CS3_SM50_B_WA 20a
ENDSTAGE STEP MOTOR
MICRO STEP FREQUENCY
LOW PULSE 20us
_CLK_SM50 20b
LATCH
_CS4_LLD_COMPENS_WA 21a
LIQUID-LEVEL DETECTION CIRCUIT
COMMAND AND STEP MOTOR
BIT-PATTERN FROM uP TO PORT
STEP MOTOR CURRENT
FROM uP TO D/A CONVERTER
PERIPHERY STATE (OS, LS, HS, LLD)
FROM PORT B TO uP
ADDRESS FOR LLD MANIFOLD NEEDLE
FROM uP TO PORT A AND D-LATCH
AD0 9a
AD1 9c
AD2 10a
AD3 10c
AD4 11a
AD5 11c
AD6 12a
AD7 12c
8 D0..7
MEMORY ADDRESS
MA0 13a
MA1 13c
READ PULSE >432ns LOW
WRITE PULSE >407ns LOW
CHIP SELECT >625ns LOW
_RD 15a
_WR 15c
_CS0_82C55_WA 17a
RESET_IO 16c
POWER UP RESET:
- CLEARS THE CONTROL REGISTER
AND PORTS ARE SET IN TRI-STATE
- DAC OUTPUT WILL GO TO 0V
- ENDSTAGE IS DISABLED
- LLD MANIFOLD IS DISABLED
- PUMPS ARE SWITCHED OF
- VALVE IS SWITCHED OF
RESET_IO
_RESET_IO
LLD_MF_TX_AD0 24c
LLD_MF_TX_AD1 24b
LLD_MF_TX_AD2 24a
_EN_LLD_MF_TX_MUX0 23b
_EN_LLD_MF_TX_MUX1 23a
_EN_LLD_MF_TX_MUX2 22a
LLD_WASTE_TX_LS70_80 22b
_EN_LLD_WASTE_TX 21b
SELECT THE MANIFOLD
NEEDLES AND THE FLUID
SEPARATOR NEEDLES FOR
LLD MEASUREMENT
I/O PORT 82C55A-2
ADDRESS/DATA BUS
CONTROL SIGNALS
PORT C OUTPUT
PORT A OUTPUT
PORT B INPUT
SM50/PHA
SM50/PHB
SM50/_ENABLE
_INH_LLD
14066_CTR1
14066_CTR2
14066_CTR3
14066_CTR4
LLD
LS99
OS50
OS51
LS68
OS69
HS99
FREE_IN
WASHER Z-MOVEMENT INIT SENSOR
MANIFOLD REPLACEMENT POS. SENSOR
WASH SHELL OVERFLOW LEVEL SENSOR
WASH SHELL ENDPOSITION SENSOR
WASTE CAP PRESENCE SENSOR
OS50 27b
OS51 28a
LS68 28b
OS69 29a
HS99 30a
FREE_IN_WA 30b
WASTE LEVEL SENSOR
LS99_SENS 29b
DETECT_IN OUT
FLUID-DETECTOR LM1830N
OPTICAL SENSOR ON
DURING READING THE SENSOR
_OS50_51_69_ON 27a
N-MOSFET IRFD 110
D G S
SELECT THE MANIFOLD NEEDLE
FOR LLD MEASUREMENT
LLD_MF_RX_AD0 26c
LLD_MF_RX_AD1 26b
LLD_MF_RX_AD2 26a
_EN_LLD_MF_RX_MUX0 25c
_EN_LLD_MF_RX_MUX1 25b
_EN_LLD_MF_RX_MUX2 25a
D-LATCH 74HC573
OUTPUT
INPUT
C
_OC
_WR
OR
_CS1_HC573_WA 18a
8 D0..7
NOT USED
MA2 14a
MA3 14c
ALE 16a
ENDSTAGE -> MICROSTEPPING MODE
SINUSOIDAL, 16 MICROSTEPS
FULL-,HALF STEP AND 4,8,16 MICROSTEPS
_CLK_SM50
_RESET_IO
D0..7
_CS2_SM50_A_WA
_WR
_CS3_SM50_B_WA
OR
_CS
_LDAC
_RST
D0...D7
D / A CONVERTER 7224
PHASE A
PHASE B
VOUT
VREF
VREF 5V LM336
CHOPPER FREQUENCY
IN1 IN2 IN3 IN4
EN
OUT1 OUT2 OUT3 OUT4
LOGIC
REF1
REF2
R_C
OSC
CURRENT CONTROLLER L6506
VSENSE1
VSENSE2
+35V
L6202 SGS
V_S
EN
IN1
IN2
BRIDGE LOGIC
SENSE
GND_15V_1
GND_35V
FULL BRIDGE DRIVER
P22
20c SM50_PHA-
21c SM50_PHA+
22c SM50_PHB-
23c SM50_PHB+
SM50
Z-MOVEMENT
MANIFOLD
LIQUID-LEVEL DETECTION CIRCUIT
D0..7
_CS4_LLD_COMPENS_WA
TONE DECODER NE 567
PHASE DETECTOR
CURRENT CONTROLLED OSCILLATOR
QUADRATURE PHASE DETECTOR
LOOP FILTER
INHIBIT LOGIC
LED
OUTPUT FILTER
GND_LLD
BUFFER
LOW PASS
HIGH PASS
SUMMATOR
AMPLIFIER
BAND PASS
D/A CONVERTER PM-7524
RFB
IOUT1
IOUT2
VREF
_WR
_CS
DATA
ALL PASS CONTROLLED
ALL PASS FIX
ANALOG SWITCH 74HC4066
IN1
OUT4
CTR1
CTR2
CTR3
CTR4
ANALOG DEMUX 74HC4051
IO
X0
X1
A
INH
B
C
GND_LLD
PIN
SIGNAL
FUNCTION, LOGIC
30c LLD_TX
LLD TRANSMITTER SIGNAL
TO MANIFOLD AND
WATER SEPARATOR
27c LLD_RX_MF
LLD RECEIVER SIGNAL
FROM MANIFOLD
28c LLD_RX_WASTE
LLD RECEIVER SIGNAL
FROM WATER SEPARATOR
29c GND_LLD_WA

Blockdiagram Washer PCB

614.126 revision 00





End Module Raw

147 919

(See next page)

End Module Frame

147 593

P1 P7 P8 W8 W10

Built-in Photometer

147 254

P20

Exit Stack

147 740

P2 P3 P4 P5 P6 P9

Electronic Rack

Dispenser

147 377

(See Washer / Dispenser)

Reagent Drawer

147 251

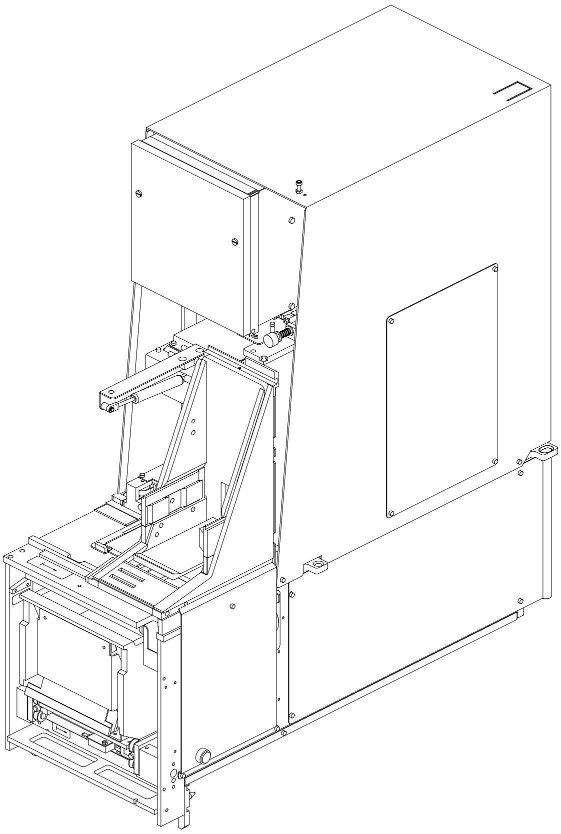
(See Washer / Dispenser)

End Module Raw

147 919

- Design
- Functional Description
    - End Module
- Calibration, Adjusting
- Removing End Module
- Removing Assemblies
    - Built-in Photometer
    - Exit Stack
    - Electronic Rack
- Replacing Spare Parts
- Spare Parts List
- 3D Drawing
- Troubleshooting

CHAPTER 5 END MODULE



5.1 End Module Raw 147 919

5.1.1 Design

Refer to the drawing on the following page:

❐ Block Diagram End Module Dwg No. 614 141

Block Diagram End Module 614.141 revision 00 (VD)

Actors:

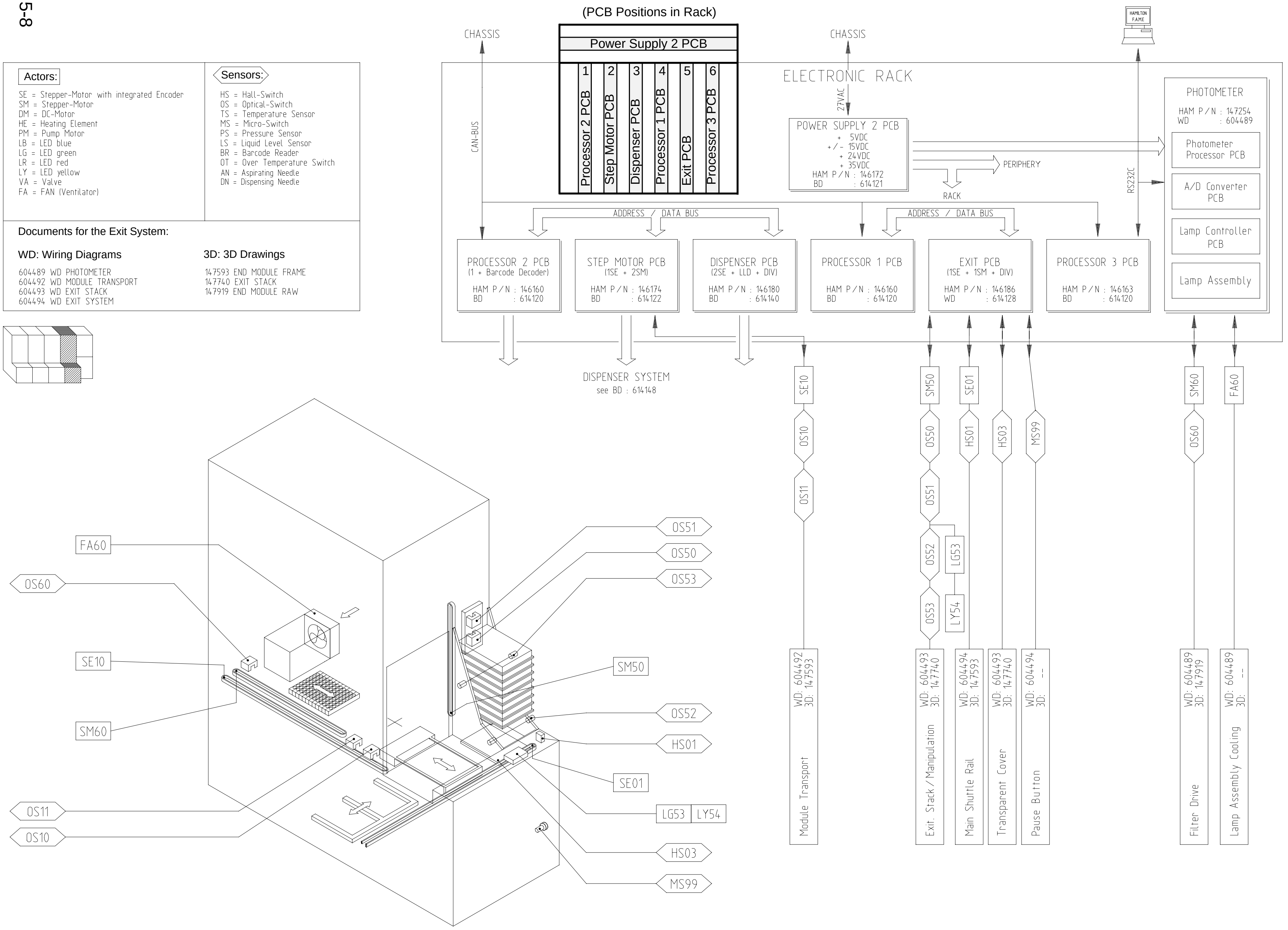
SE = Stepper-Motor with integrated Encoder
SM = Stepper-Motor
DM = DC-Motor
HE = Heating Element
PM = Pump Motor
LB = LED blue
LG = LED green
LR = LED red
LY = LED yellow
VA = Valve
FA = FAN (Ventilator)

Sensors:

HS = Hall-Switch
OS = Optical-Switch
TS = Temperature Sensor
MS = Micro-Switch
PS = Pressure Sensor
LS = Liquid Level Sensor
BR = Barcode Reader
OT = Over Temperature Switch
AN = Aspirating Needle
DN = Dispensing Needle

Documents for the Exit System:

WD: Wiring Diagrams	3D: 3D Drawings
604489 WD PHOTOMETER	147593 END MODULE FRAME
604492 WD MODULE TRANSPORT	147740 EXIT STACK
604493 WD EXIT STACK	147919 END MODULE RAW
604494 WD EXIT SYSTEM	


(PCB Positions in Rack)
Power Supply 2 PCB
1 Processor 2 PCB
2 Step Motor PCB
3 Dispenser PCB
4 Processor 1 PCB
5 Exit PCB
6 Processor 3 PCB
CHASSIS
CHASSIS
HAMILTON F.A.M.E.
ELECTRONIC RACK
CAN-BUS
27VAC
POWER SUPPLY 2 PCB
+ 5VDC
+/- 15VDC
+ 24VDC
+ 35VDC
HAM P/N : 146172
BD : 614121
PERIPHERY
RACK
RS232C
PHOTOMETER
HAM P/N : 147254
WD : 604489
Photometer Processor PCB
A/D Converter PCB
Lamp Controller PCB
Lamp Assembly
ADDRESS / DATA BUS
ADDRESS / DATA BUS
PROCESSOR 2 PCB
(1 + Barcode Decoder)
HAM P/N : 146160
BD : 614120
STEP MOTOR PCB
(1SE + 2SM)
HAM P/N : 146174
BD : 614122
DISPENSER PCB
(2SE + LLD + DIV)
HAM P/N : 146180
BD : 614140
PROCESSOR 1 PCB
HAM P/N : 146160
BD : 614120
EXIT PCB
(1SE + 1SM + DIV)
HAM P/N : 146186
WD : 614128
PROCESSOR 3 PCB
HAM P/N : 146163
BD : 614120
DISPENSER SYSTEM
see BD : 614148
SE10
OS10
OS11
SM50
OS50
OS51
OS52
LG53
OS53
LY54
SE01
HS01
HS03
MS99
SM60
OS60
FA60
Actor
Sensors
Function / Diagrams
Module Transport WD: 604492 3D: 147593
Exit. Stack / Manipulation WD: 604493 3D: 147740
Main Shuttle Rail WD: 604494 3D: 147593
Transparent Cover WD: 604493 3D: 147740
Pause Button WD: 604494 3D: --
Filter Drive WD: 604489 3D: 147919
Lamp Assembly Cooling WD: 604489 3D: --
FA60
OS60
SE10
SM60
OS11
OS10
OS51
OS50
OS53
SM50
OS52
HS01
SE01
LG53 LY54
HS03
MS99

5.1.2 Functional Description End Module

The End Module is used for reagent dispensing, photometric measurements and mixing (shaking of the plate). The Exit Stack and Manipulation Position are also located in this module allowing plates to be removed from the instrument.

- Dispensing function:
    - same as in the washer/dispenser module
    - suitable for dispensing: reagents, stop solution
- Photometer:
    - 8 measuring channels (+1 reference channel)
    - filter range 340 to 750 nm
    - 5 integrated filters (up to 8 filters possible)
    - scan mode
    - suitable for ass well types
    - mixing mode
- Exit Stack
    - controlled stacking for up to 10 micro titer plates
    - plates can be unloaded at any time without process interruption
    - manipulation position for removing micro titer plates for external operations

For further information consult the User Manual section 2.6.

5.1.3 Calibration, Adjusting

5.1.4 Removing End Module

Refer to Chapter 1, Section 1.1.5.3.3

5.1.5 Removing Assemblies

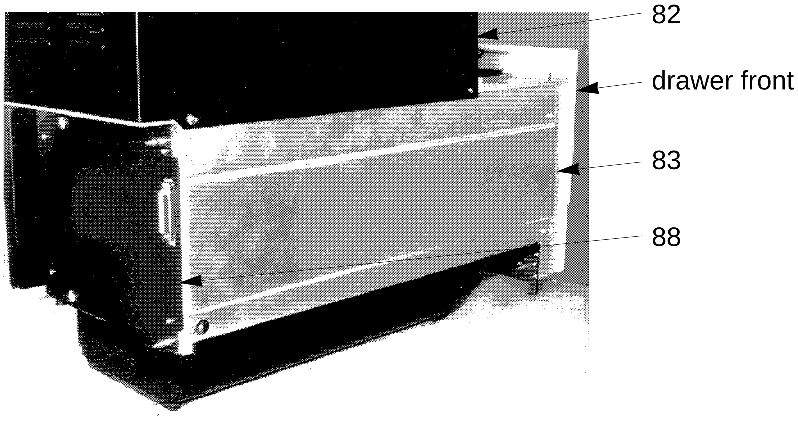
NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

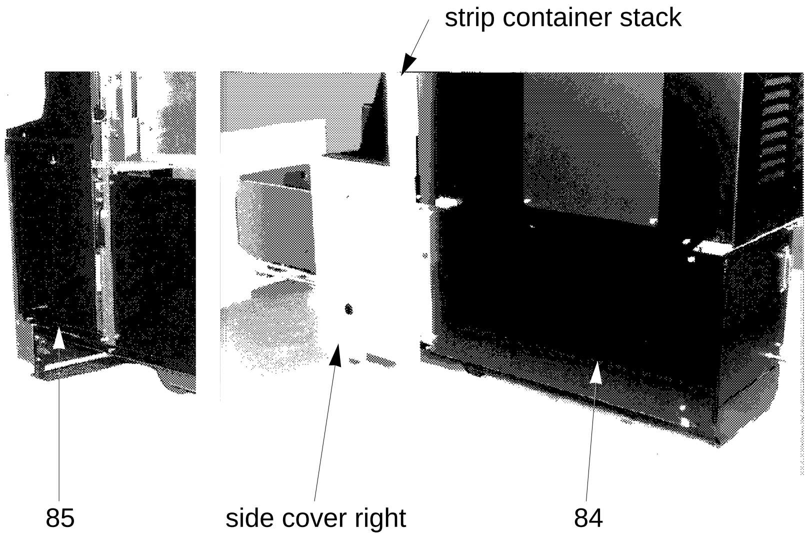
In order to carry out the following tasks, the end module must be removed from the chassis - refer to section 1.1.5.3.3.

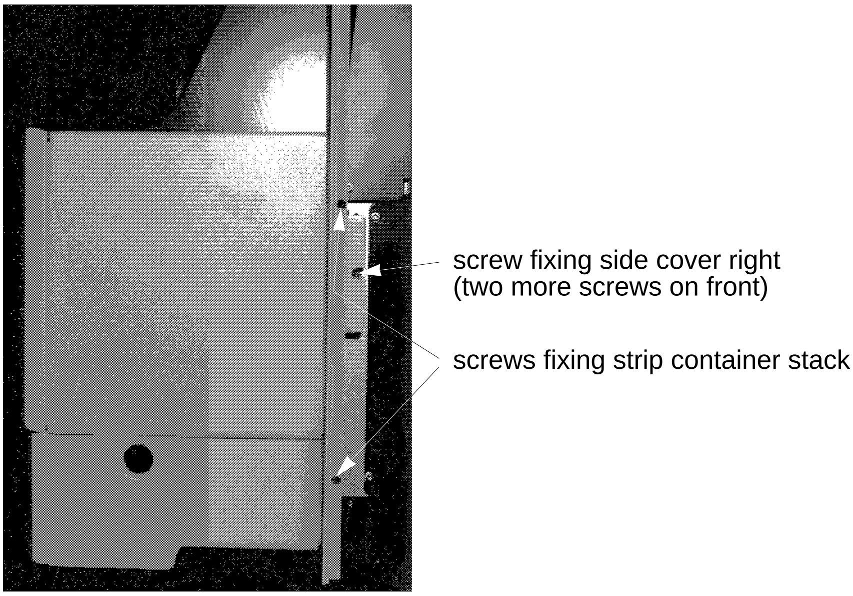
Some of the following items must be removed to replace spare parts:

- Hood	item 82
- Side cover left	item 83
- Side cover right rear	item 84
- Side cover right front	item 85
- Rear cover	item 88
- Strip container stack	
- Drawer front	
- Side cover right	

When unscrewing the *drawer front*, hold the panel to prevent it from falling on the floor.



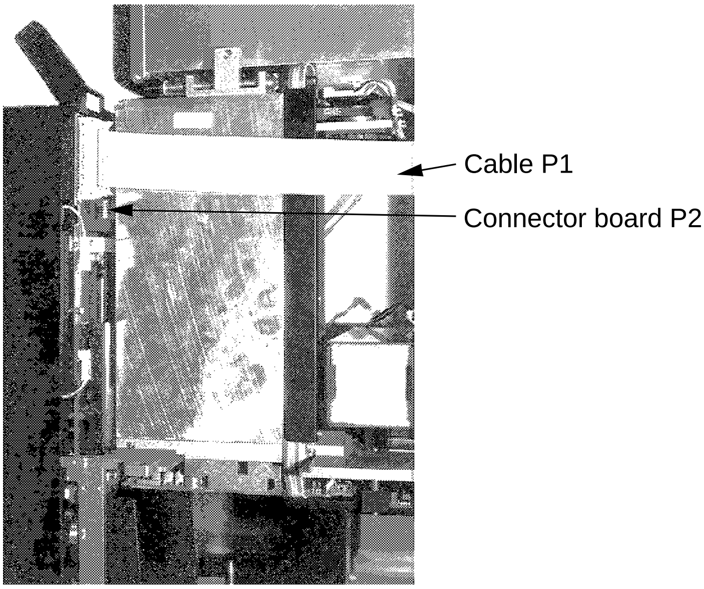



screw fixing side cover right
(two more screws on front)
screws fixing strip container stack

5.1.5.1 Dispenser item 2

Remove *hood item 82* and *side cover right rear item 84* (see section 5.1.5).

Disconnect cable P1 on connector board P2 (exit stack).


Cable P1
Connector board P2

Now follow the instructions in section 4.1.4.1.

5.1.5.2 Reagent drawer item 3

Remove *side cover right rear item 84*, *side cover right front item 85* and end module *drawer front* (see section 5.1.5).

Now follow the instructions in section 4.1.4.2.

5.1.5.3 Build-in Photometer item 80

See section 5.3.4.

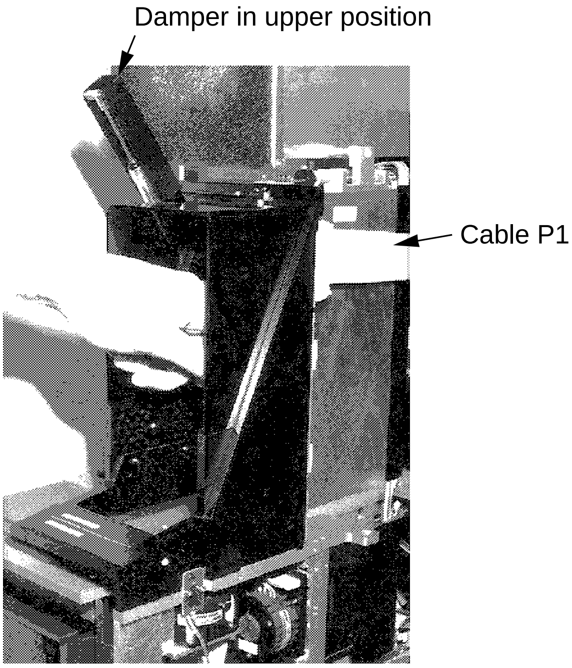
5.1.5.4 Exit Stack item 4

Remove *hood item 82* and *side cover right front item 85* (see section 5.1.5).

Disconnect cable P1 on connector board P2 (exit stack).

For safety reasons put damper to upper position.

Unscrew exit stack (4 screws) and carefully it lift it out.



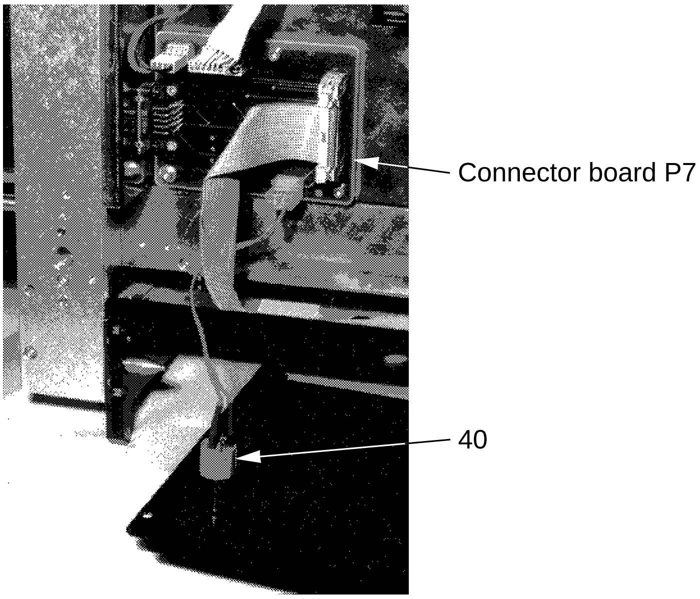
5.1.6 Replacing Spare Parts

5.1.6.1 Pause Button item 40

Remove *side cover right front item 85* (see section 5.1.5).

Disconnect pause button on connector board P7 (end module frame).

Unscrew pause button from side cover right front.



5.1.7 Spare Parts List

END MODULE RAW 147919 Revision: 02

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147593	END MODULE FRAME	01	1	1.000	
147377	DISPENSER	02	2	1.000	
147251	REAGENT DRAWER	01	3	1.000	B
147740	EXIT-STACK	00	4	1.000	B
146170	MOTHERBOARD P PCB	01	20	1.000	C
146172	POWER SUPPLY 2 PCB	04	21	1.000	A
146160	PROCESSOR 1 PCB	01	22	1.000	
146162	PROCESSOR 2 PCB	01	23	1.000	
146163	PROCESSOR 3 PCB	01	24	1.000	
146174	STEP MOTOR PCB	00	25	1.000	A
146180	DISPENSER PCB	01	26	1.000	A
146186	EXIT PCB	03	27	1.000	A
146285	EMERGANCY STOP BUTTON	01	40	1.000	B
146242	EL. RACK FAN	00	41	1.000	B
146211	CABLE W1	00	60	1.000	C
146212	CABLE W2	00	61	2.000	C
146214	CABLE W4	00	63	1.000	C
146215	CABLE W5	00	64	1.000	C
146216	CABLE W6	00	65	1.000	C
146324	CABLE P1	00	66	1.000	C
146325	CABLE P2	00	67	1.000	C
146326	CABLE P3	00	68	1.000	C
146327	CABLE P4	01	69	1.000	C
147254	BUILT-IN PHOTOMETER	02	80	1.000	C
147824	EL.RACK GEHAEUSE	01	81	1.000	
147956	HAUBE END MODUL	00	82	1.000	
147820	SEITENBLECH LINKS UNTEN	00	83	1.000	
147957	SEITENBLECH RECHTS HINTEN	00	84	1.000	
147959	SEITENBLECH RECHTS VORNE	00	85	1.000	
147961	EL.RACK STUETZBL. HINTEN	01	86	1.000	
147823	EL.RACK STUETZE	00	87	1.000	
147958	RUECKWANDBLECH	00	88	1.000	
147960	SEITENABD. HAUBE END MOD.	00	89	1.000	
147994	EL.RACK RUECKWAND	00	90	1.000	
147822	EL.RACK STUETZBL. HI RE	00	91	1.000	
148402	ABSCHIRMBLECH	00	92	1.000	
147879	DISTANZBOLZEN	00	93	2.000	
147581	JUSTIERSCHEIBE	00	94	2.000	A
361036	KABELHALTER	00	100	3.000	
361003	KABELBEF. 0250 S	00	101	1.000	
361015	KABELBEF. 3484-1000	00	102	10.000	
148346	UNTERLAGE	00	104	1.000	
511006	LOCTITE 222 50mL	00	110	0.000	T
511010	LOCTITE 638 50mL	00	111	0.000	T
255089	LABEL PCB POS. END MODULE	00	160	1.000	

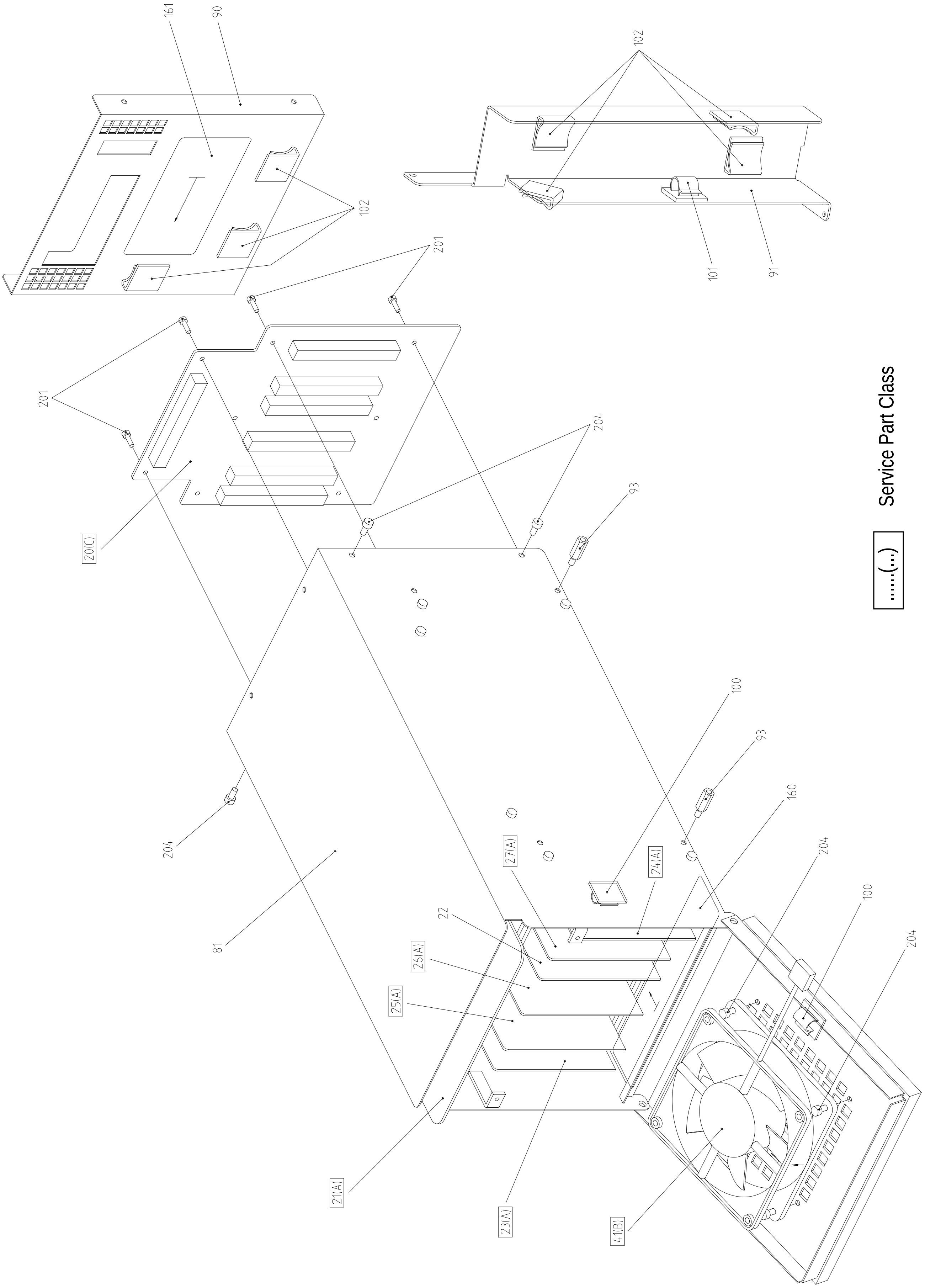
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
255099	LABEL KABEL POS. END MODULE	00	161	1.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	162	1.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	200	33.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	201	19.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	203	4.000	
400302	ZYL-SCHR.M 4X 8 DIN912 A2	00	204	14.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	205	1.000	
255042	WARNZ. BIOGEFAEHRDUNG	00	223	1.000	
608300	Q-BESCHEINIGUNG END MOD.	01	250	1.000	
608305	TECHN. STAND END MOD.	01	251	1.000	
281112	DICHTPROFIL SELBSTK. 6x3MM	00	253	0.380	

5.1.8 3D Drawings End Module Raw

Next 2 pages

End Module Raw

Dwg. 147 919/1 revision 02

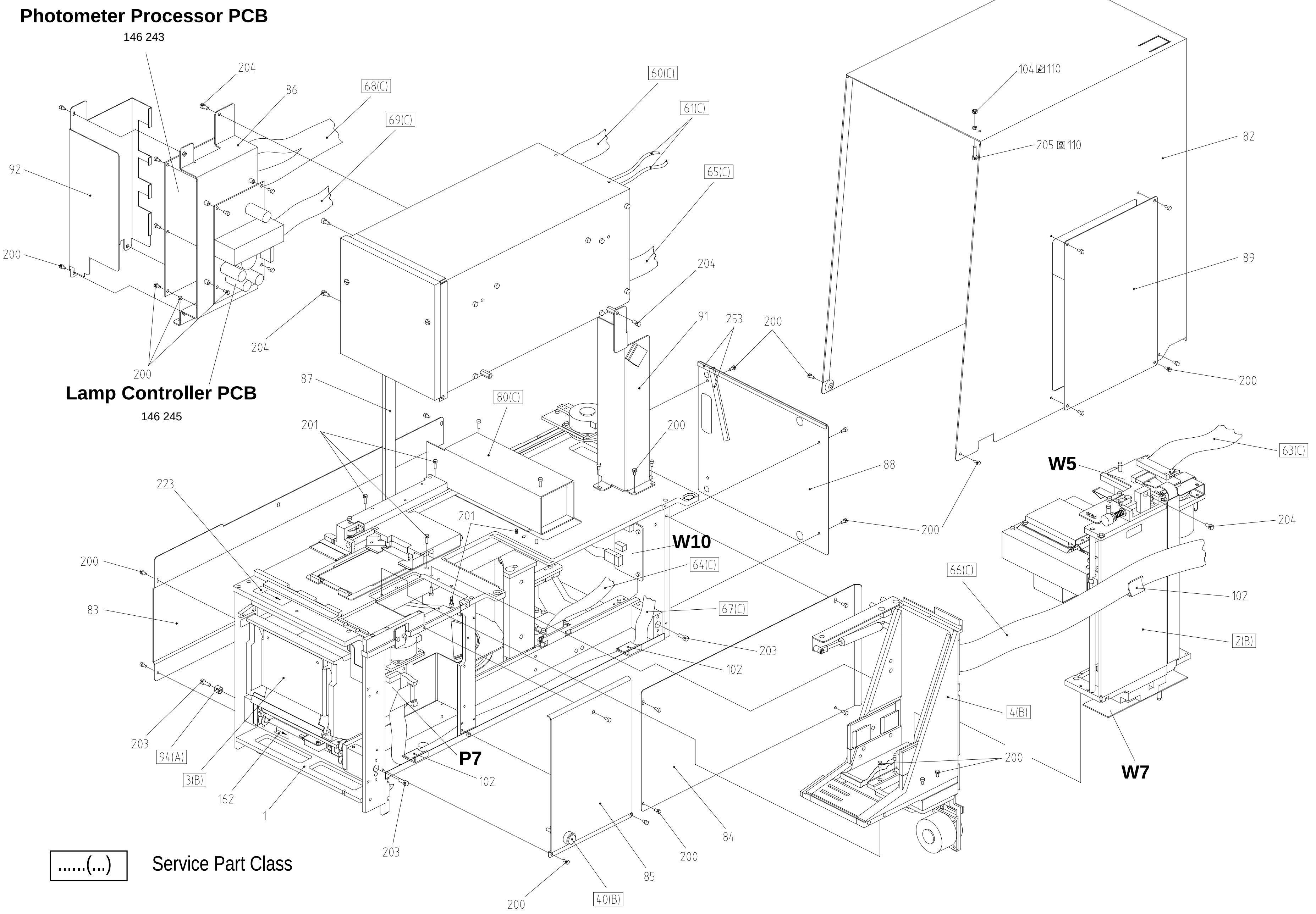

161
90
102
102
201
101
91
201
204
20(C)
93
100
93
160
204
27(A)
24(A)
22
26(A)
25(A)
100
204
81
204
21(A)
23(A)
41(B)

Service Part Class

......(...)

End Module Raw

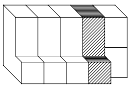
Dwg. 147 919/2 revision 02

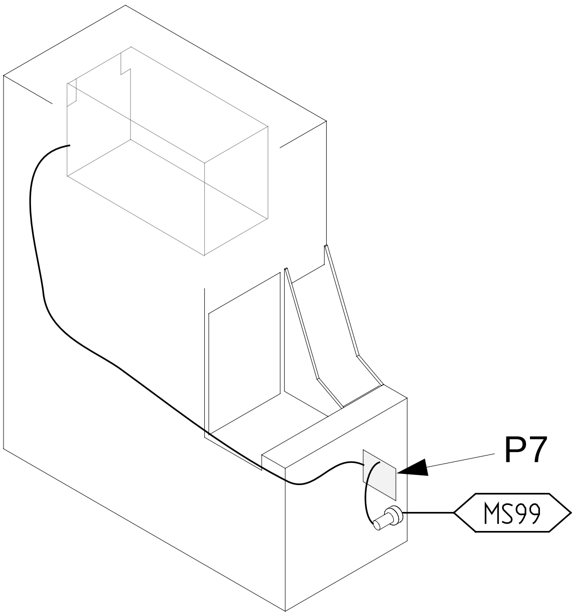

Photometer Processor PCB
146 243
Lamp Controller PCB
146 245
204
86
68(C)
69(C)
60(C)
61(C)
65(C)
104 ☒ 110
205 ⊡ 110
82
89
92
200
204
87
80(C)
91
253
200
201
223
201
200
83
W10
64(C)
67(C)
88
200
204
63(C)
W5
66(C)
102
2(B)
203
102
4(B)
200
W7
203
94(A)
3(B)
162
1
P7
102
203
85
40(B)
200
84
200

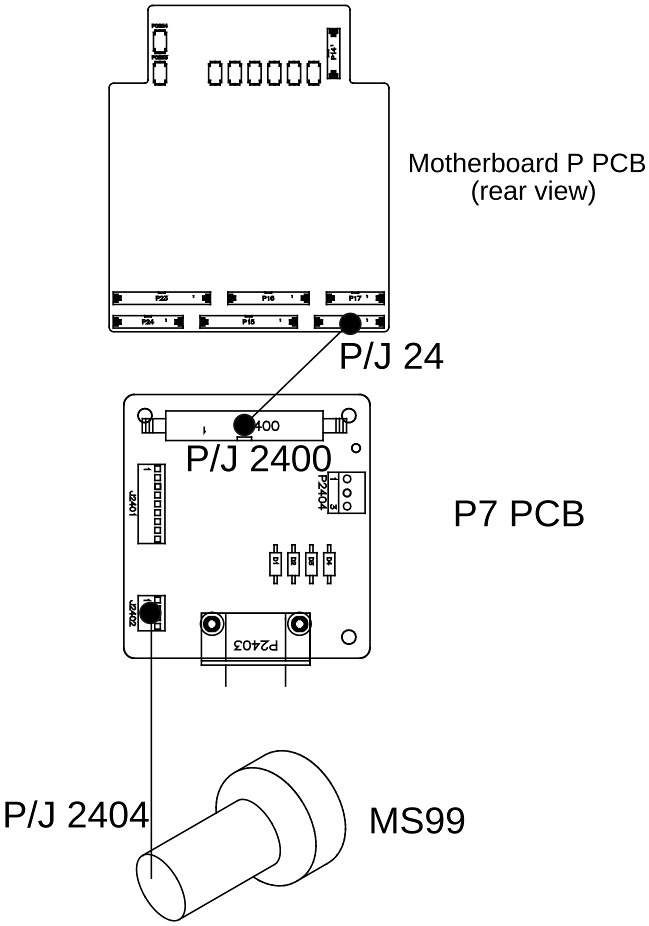
......(...) Service Part Class

5.1.9 Troubleshooting End Raw / End Dispenser / End Drawer

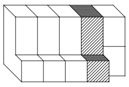
Module: End
Assembly: End Module Raw
Sensor: Micro-Switch MS99
Pause Button
Boards: P7, Motherboard P
Error Message:

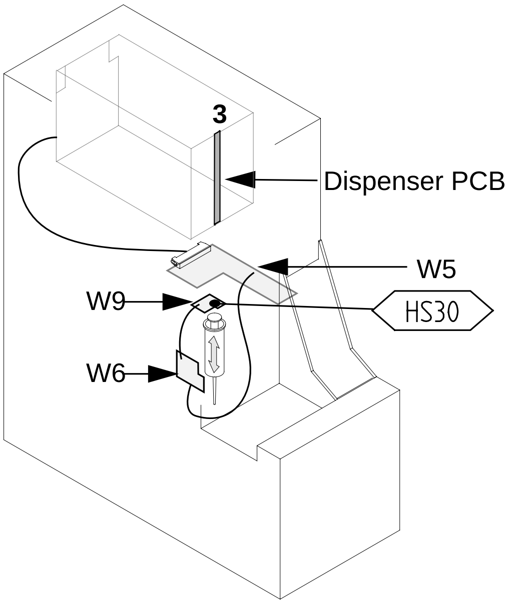


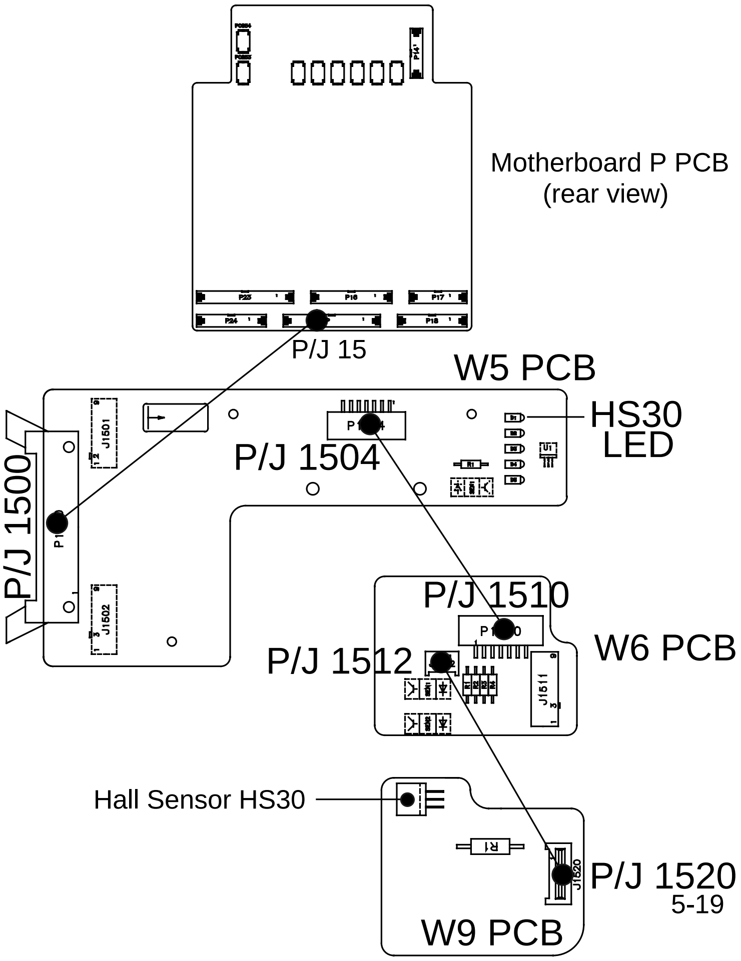



Motherboard P PCB
(rear view)
P/J 24
P/J 2400
P7 PCB
P2404
J2401
J2402
P2403
P/J 2404
MS99

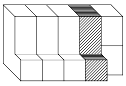
Module: End
Assembly: Dispenser
Sensor: Hall Sensor HS30
Dosing Drive Initialization
Boards: W5, W6, W9, Dispenser PCB
Motherboard P
Error Message:

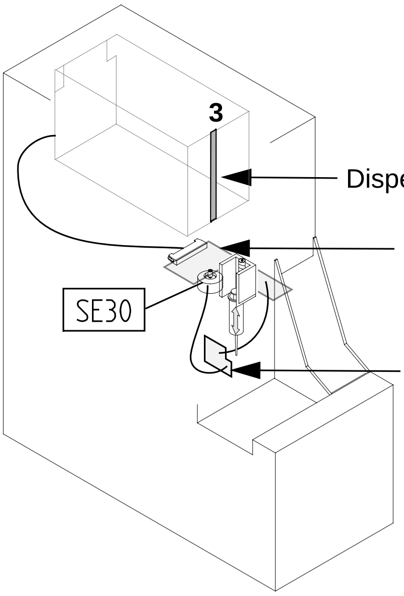


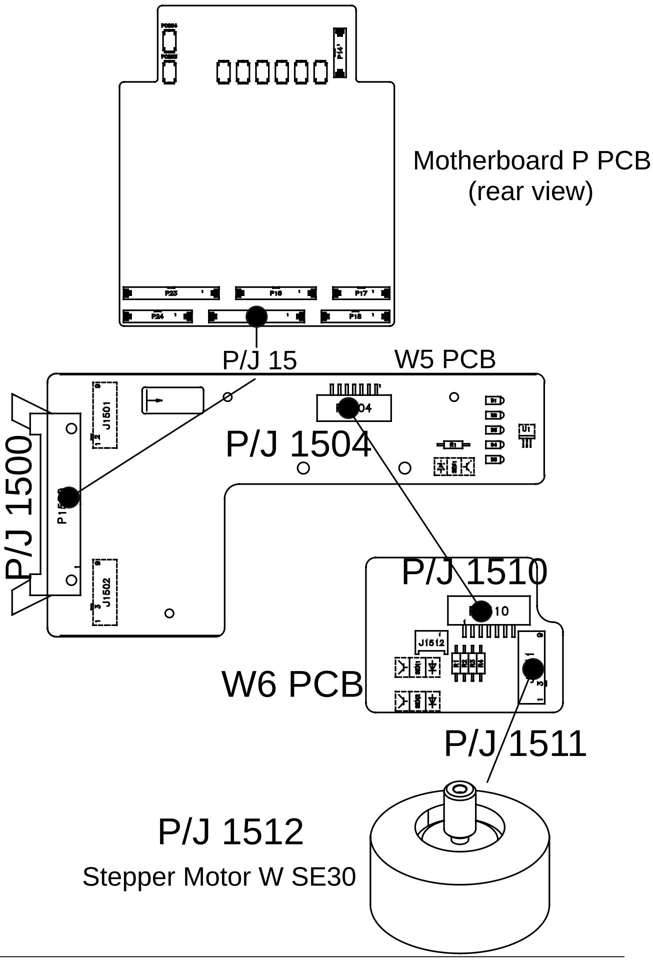

3
Dispenser PCB
W5
W9
HS30
W6


Motherboard P PCB
(rear view)
P/J 15
W5 PCB
HS30
LED
P/J 1500
J1501
J1502
P/J 1504
P/J 1510
W6 PCB
P/J 1512
J1511
Hall Sensor HS30
R1
P/J 1520
W9 PCB

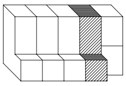
Module: End
Assembly: Dispenser
Actor: Stepper Motor with integrated Encoder
SE30 Dosing Drive
Boards: W5, W6, Dispenser PCB
Motherboard P
Error Message:

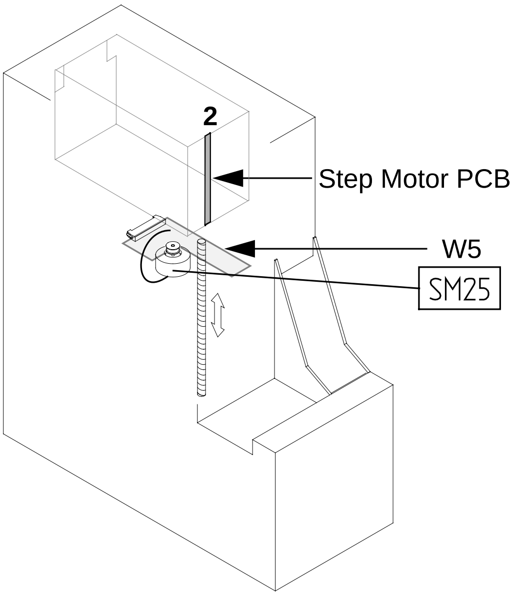


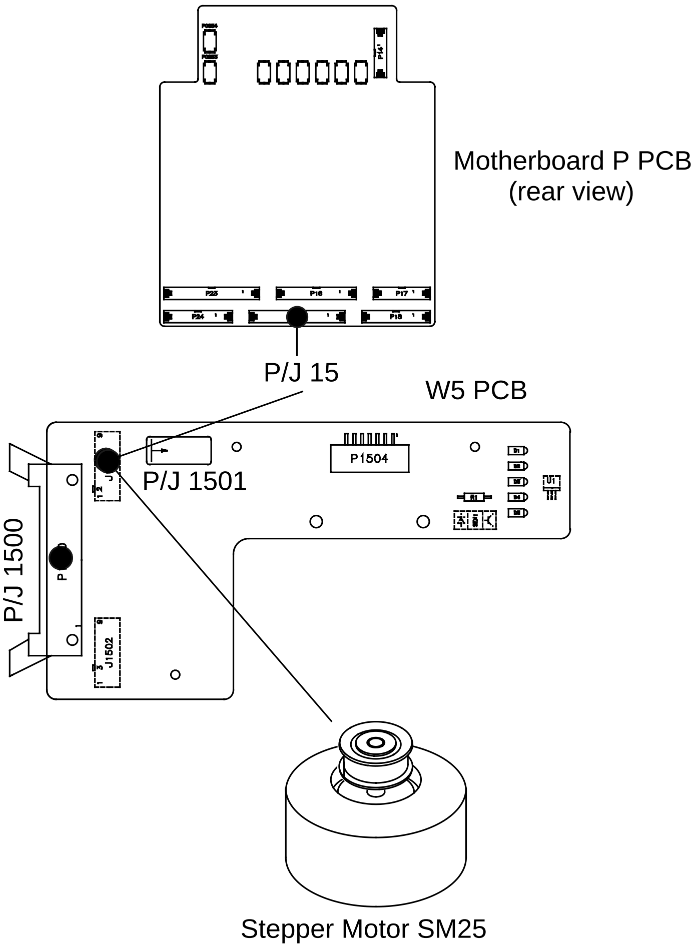

3
Dispenser PCB
W5
SE30
W6


Motherboard P PCB
(rear view)
P/J 15
W5 PCB
P/J 1504
P/J 1500
P/J 1510
W6 PCB
P/J 1511
P/J 1512
Stepper Motor W SE30

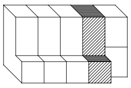
Module: End
Assembly: Dispenser
Actor: Stepper Motor SM25
Dosing Arm Z-Movement
Boards: W5, Step Motor PCB
Motherboard P
Error Message:

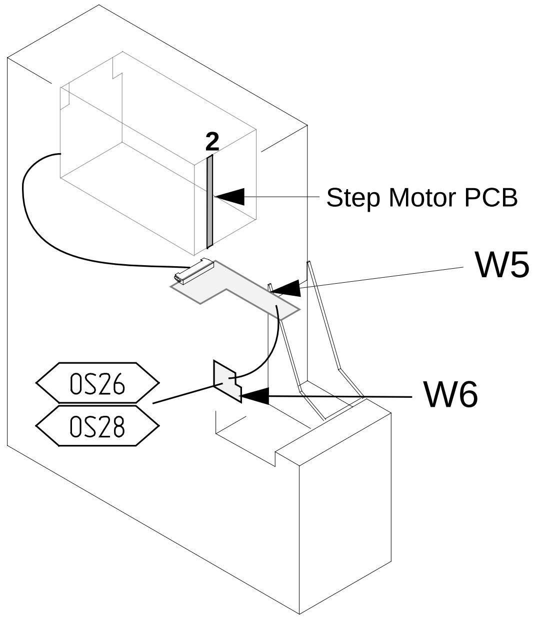


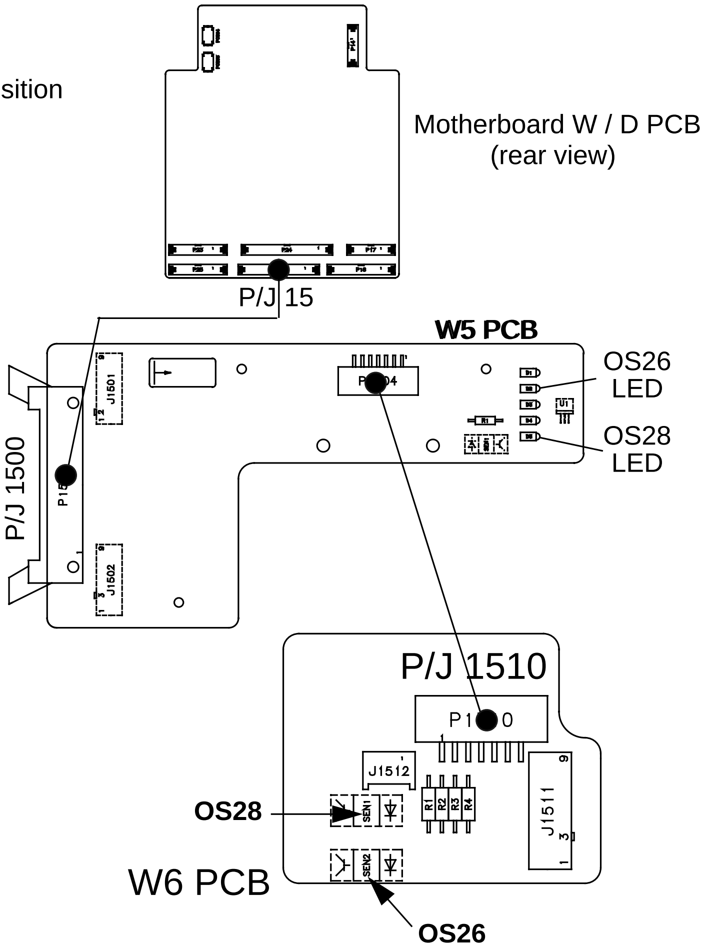

2
Step Motor PCB
W5
SM25


Motherboard P PCB
(rear view)
P/J 15
W5 PCB
P/J 1501
P/J 1500
Stepper Motor SM25

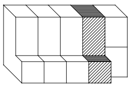
Module: End
Assembly: Dispenser
Sensors: Optical Sensor OS28 Syringe Tip Position & OS26 Dosing Arm Z-Movement
Boards: W5, W6, Step Motor PCB Motherboard P
Error Message:

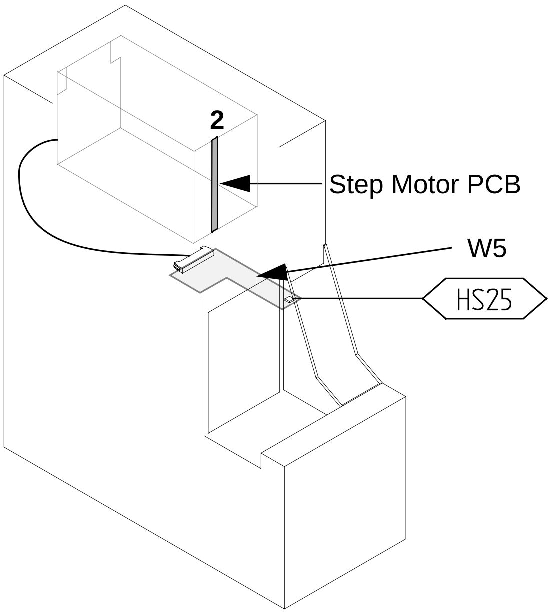


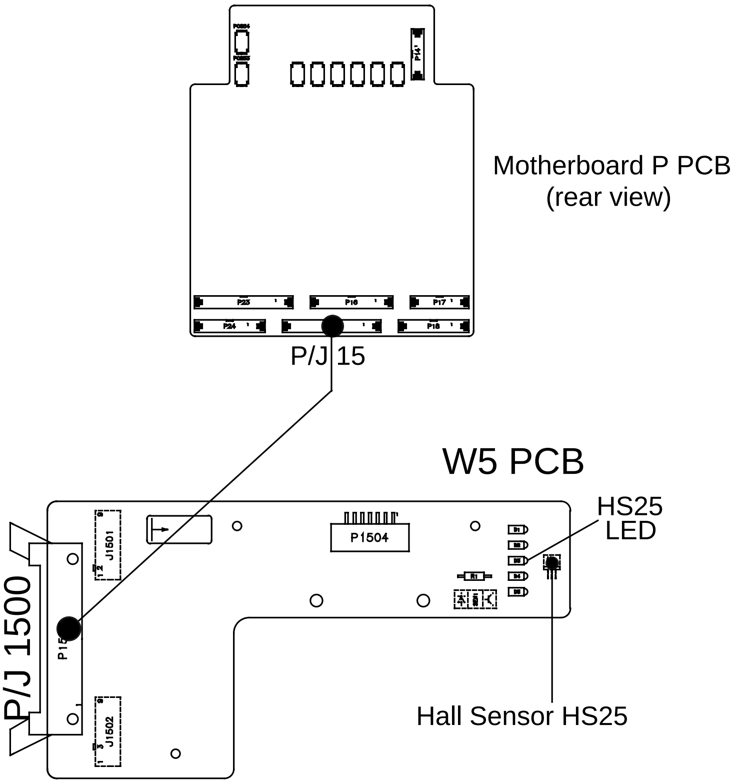

2
Step Motor PCB
W5
OS26
OS28
W6


Motherboard W / D PCB
(rear view)
P/J 15
W5 PCB
OS26
LED
OS28
LED
P/J 1500
J1501
J1502
P1504
P/J 1510
P1510
J1512
J1511
R1
R2
R3
R4
SEN1
SEN2
OS28
W6 PCB
OS26

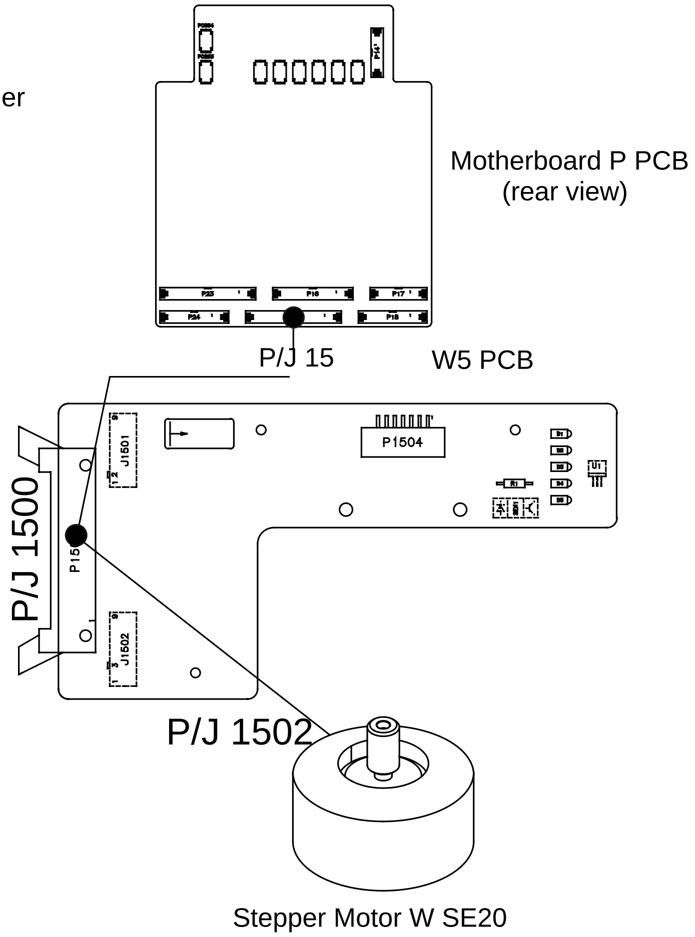
Module: End
Assembly: Dispenser
Sensor: Hall Sensor HS25 Z-Movement
Boards: W5, Step Motor PCB Motherboard P
Error Message:

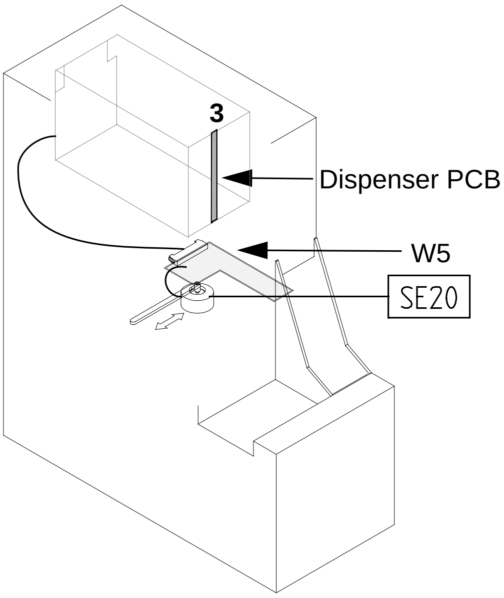



2
Step Motor PCB
W5
HS25

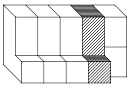

Motherboard P PCB
(rear view)
P/J 15
W5 PCB
HS25
LED
P/J 1500
J1501
J1502
P1504
Hall Sensor HS25

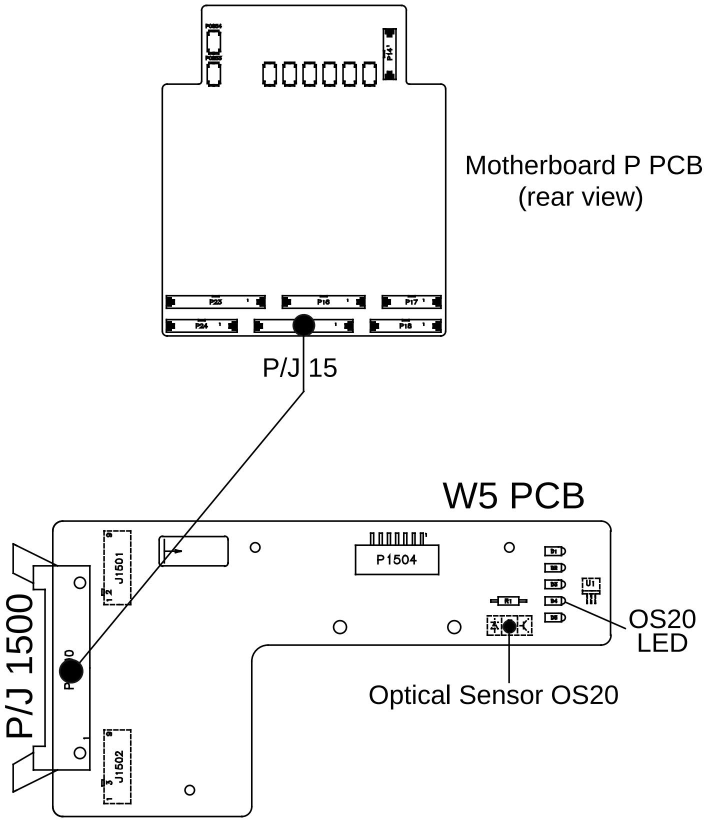
Module:	End
Assembly:	Dispenser
Actor:	Stepper Motor with integrated Encoder SE20 Dosing Arm X - Movement
Boards:	W5, Dispenser PCB Motherboard P
Error Message:	

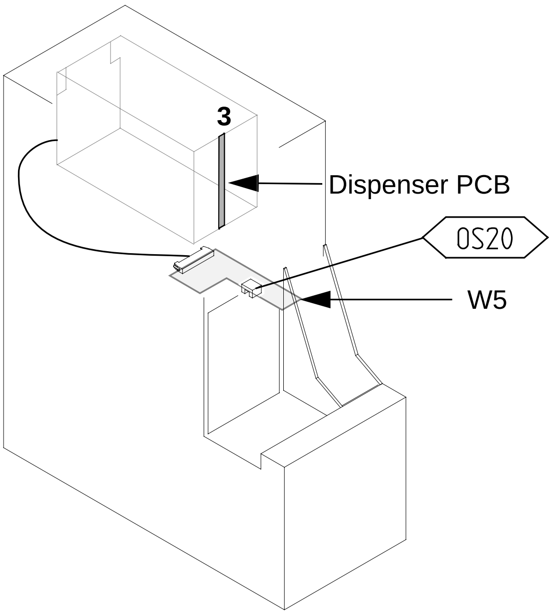

Motherboard P PCB
(rear view)
P23
P16
P17
P24
P18
P14
P/J 15
W5 PCB
P1504
J1501
P15
J1502
P/J 1500
P/J 1502
Stepper Motor W SE20


3
Dispenser PCB
W5
SE20

Module:	End
Assembly:	Dispenser
Sensor:	Optical Sensor OS20 X-Movement
Boards:	W5, Dispenser PCB Motherboard P
Error Message:	

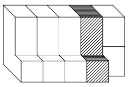


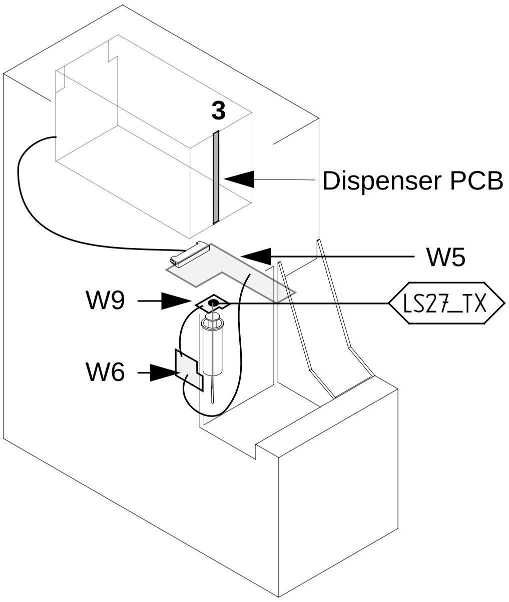

Motherboard P PCB
(rear view)
P23
P16
P17
P24
P18
P14
P/J 15
W5 PCB
P1504
J1501
J1502
P/J 1500
OS20
LED
Optical Sensor OS20

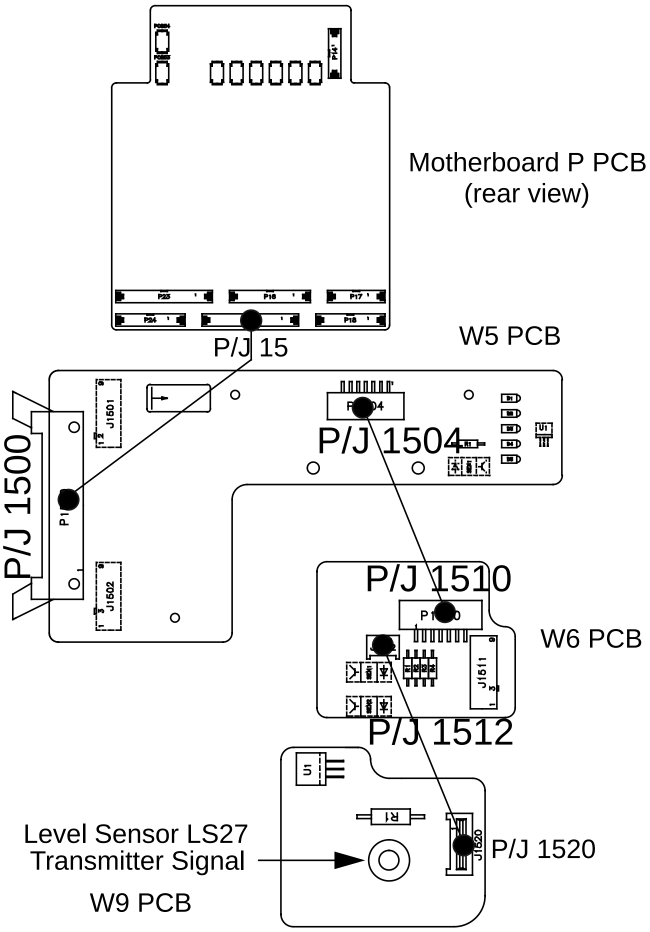

3
Dispenser PCB
OS20
W5

Module:	End
Assembly:	Dispenser
Sensor:	Level Sensor LS27 Transmitter Signal (TX)
Boards:	W5, W6, W9, Dispenser PCB Motherboard P

Error Message:

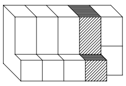


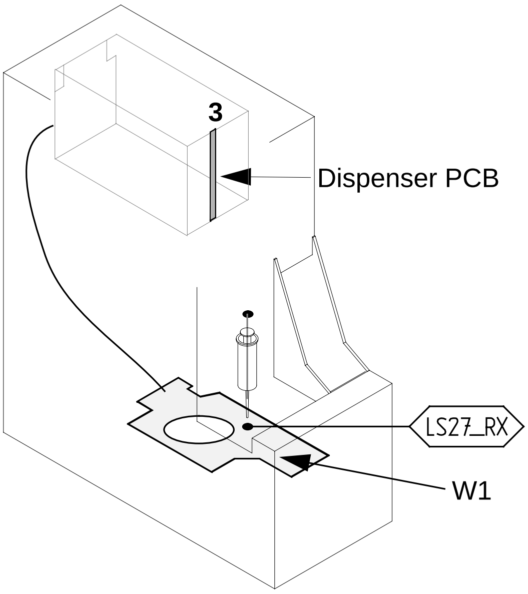

3
Dispenser PCB
W5
W9
LS27_TX
W6

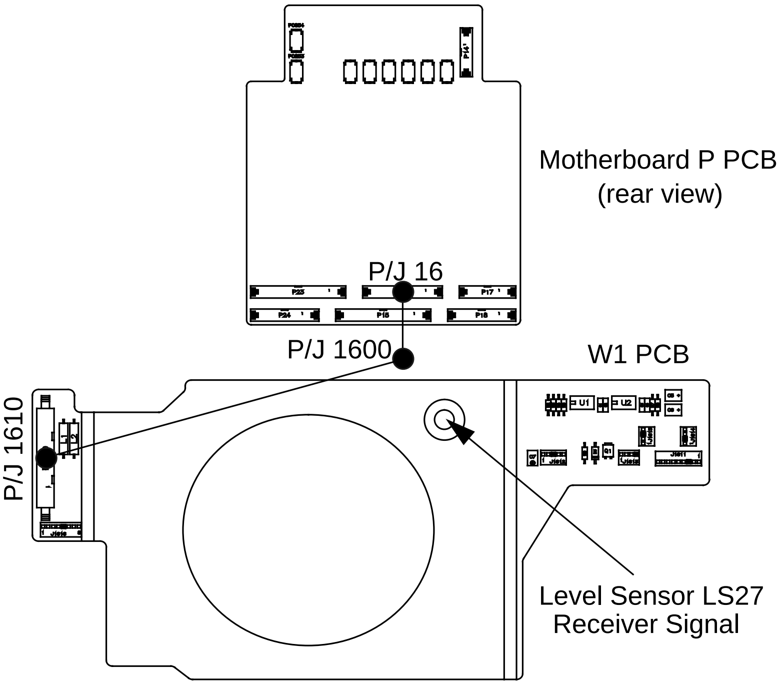

Motherboard P PCB
(rear view)
P/J 15
W5 PCB
P/J 1500
P/J 1504
P/J 1510
W6 PCB
P/J 1512
Level Sensor LS27
Transmitter Signal
P/J 1520
W9 PCB

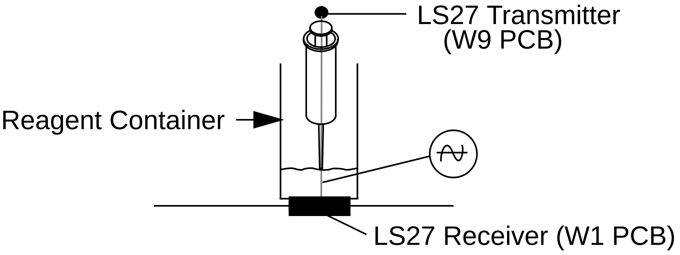
Module:	End
Assembly:	Dispenser
Sensor:	Level Sensor LS27 Receiver Signal (RX)
Boards:	W1, Dispenser PCB Motherboard P

Error Message:

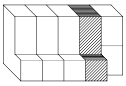


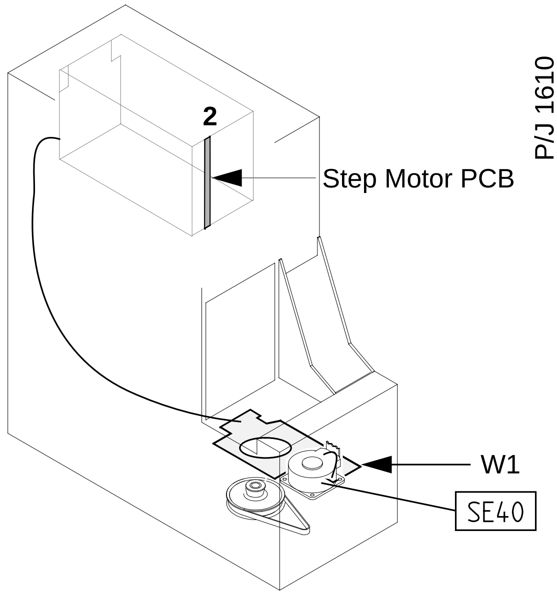

3
Dispenser PCB
LS27_RX
W1

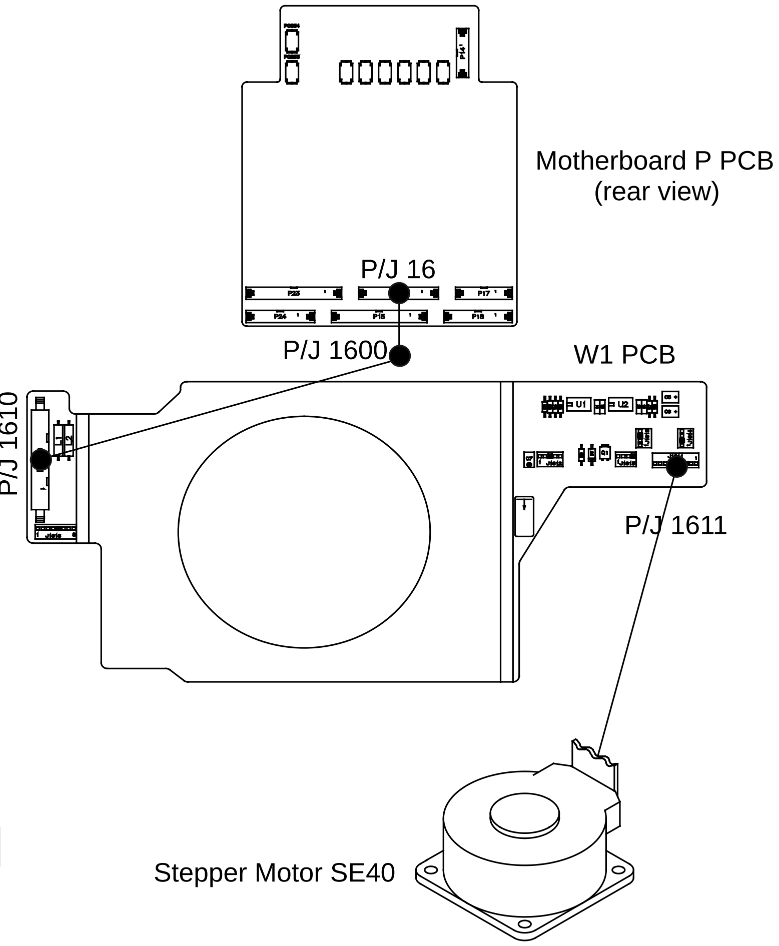

Motherboard P PCB
(rear view)
P/J 16
P/J 1600
W1 PCB
P/J 1610
Level Sensor LS27
Receiver Signal


LS27 Transmitter
(W9 PCB)
Reagent Container
LS27 Receiver (W1 PCB)

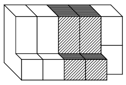
Module: End
Assembly: Reagent Drawer
Actor: Reagent Rotor Drive SE40
Boards: W1, Step Motor PCB
Motherboard P
Error Message:

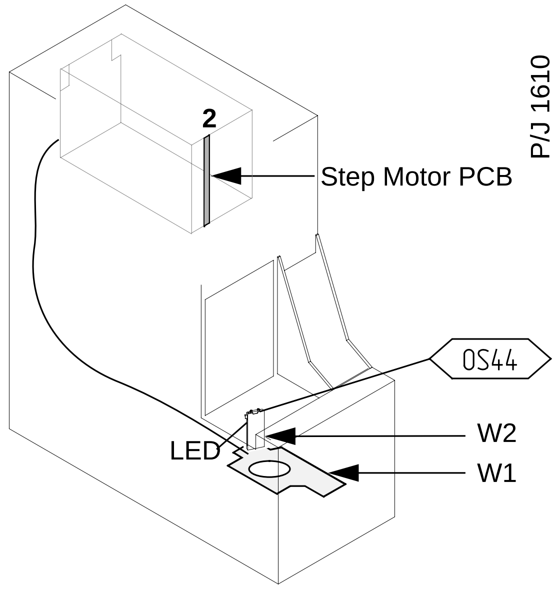


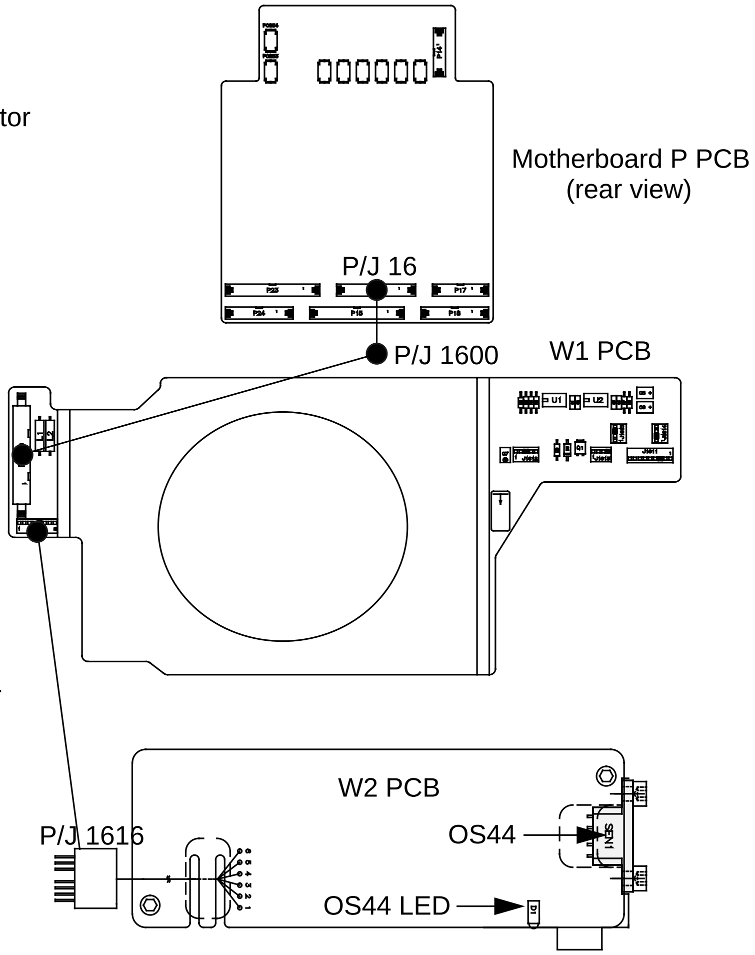

2
Step Motor PCB
W1
SE40


Motherboard P PCB
(rear view)
P/J 16
P/J 1600
W1 PCB
P/J 1610
P/J 1611
Stepper Motor SE40

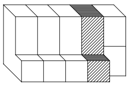
Module: End
Assembly: Reagent Drawer
Sensor: Optical Sensor OS44
Syringe & Reagent Cap Detector
Boards: W1, W2, Step Motor PCB
Motherboard P
Error Message:

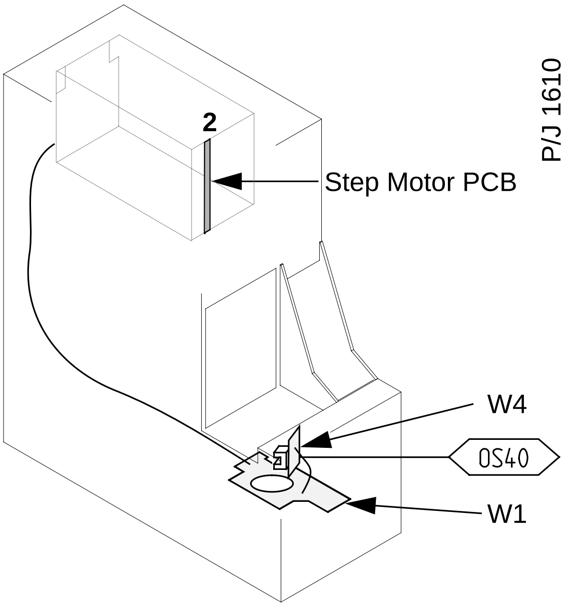


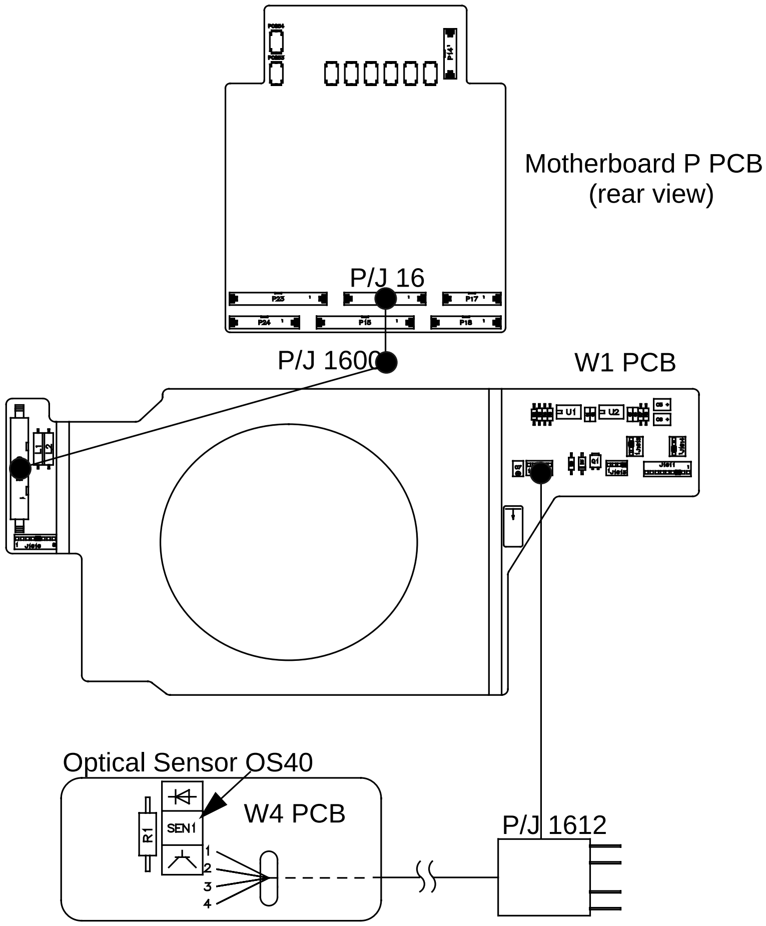

2
Step Motor PCB
OS44
LED
W2
W1


Motherboard P PCB
(rear view)
P/J 16
P/J 1600
W1 PCB
P/J 1610
W2 PCB
P/J 1616
OS44
OS44 LED

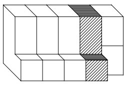
Module: End
Assembly: Reagent Drawer
Sensor: Optical Sensor OS40
Carousel Initialization
Boards: W1, W4, Step Motor PCB
Motherboard P
Error Message:

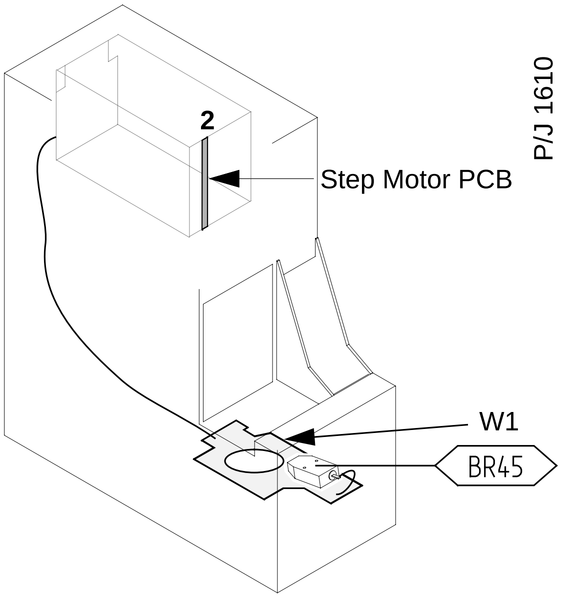


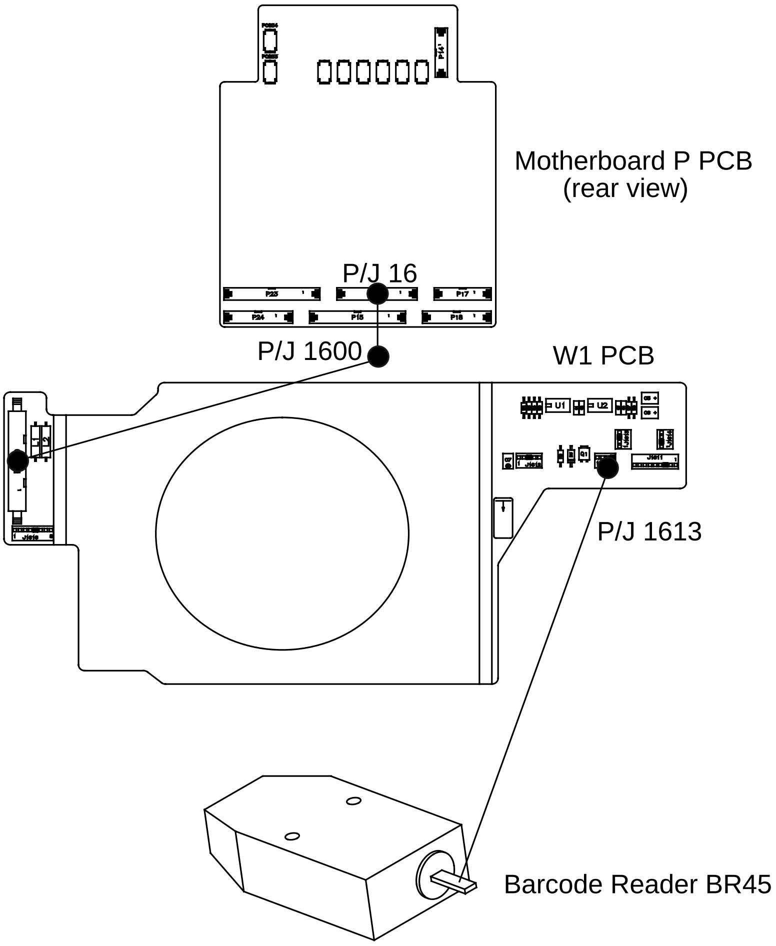

2
Step Motor PCB
W4
OS40
W1


Motherboard P PCB
(rear view)
P/J 16
P23
P17
P24
P15
P18
P/J 1600
W1 PCB
U1
U2
P/J 1610
Optical Sensor OS40
SEN1
R1
W4 PCB
1
2
3
4
P/J 1612

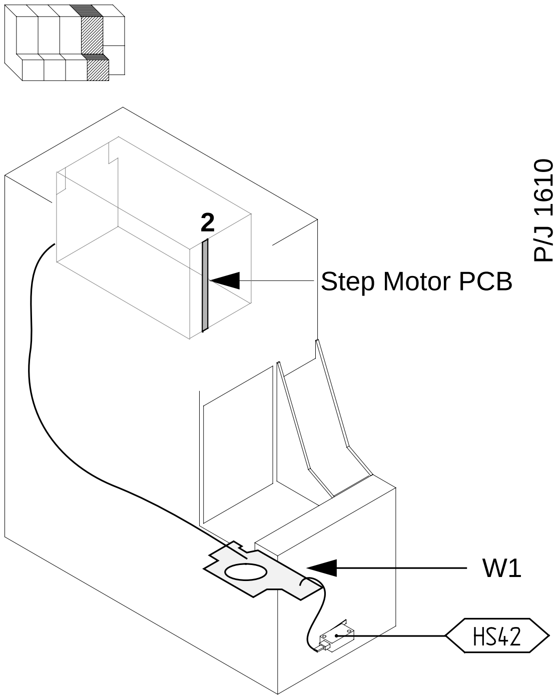
Module: End
Assembly: Reagent Drawer
Sensor: Barcode Reader BR45
Reagent Container
Boards: W1, Step Motor PCB
Motherboard P
Error Message:

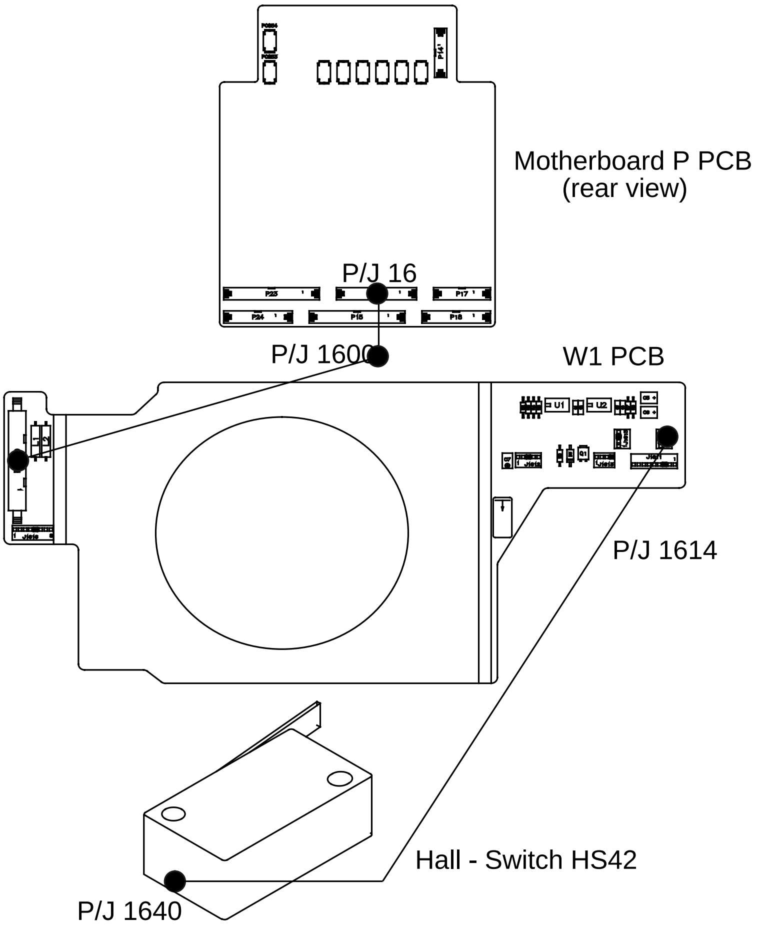



2
Step Motor PCB
W1
BR45

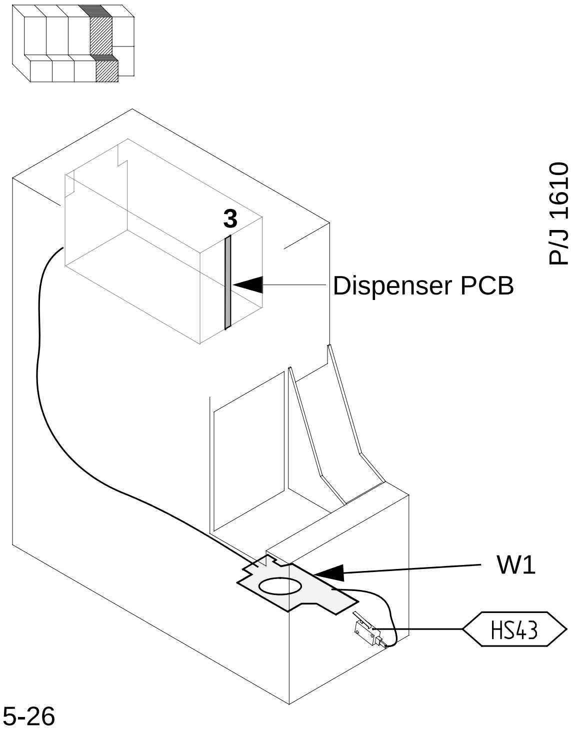

Motherboard P PCB
(rear view)
P/J 16
P23
P17
P24
P15
P18
P/J 1600
W1 PCB
U1
U2
P/J 1610
P/J 1613
Barcode Reader BR45

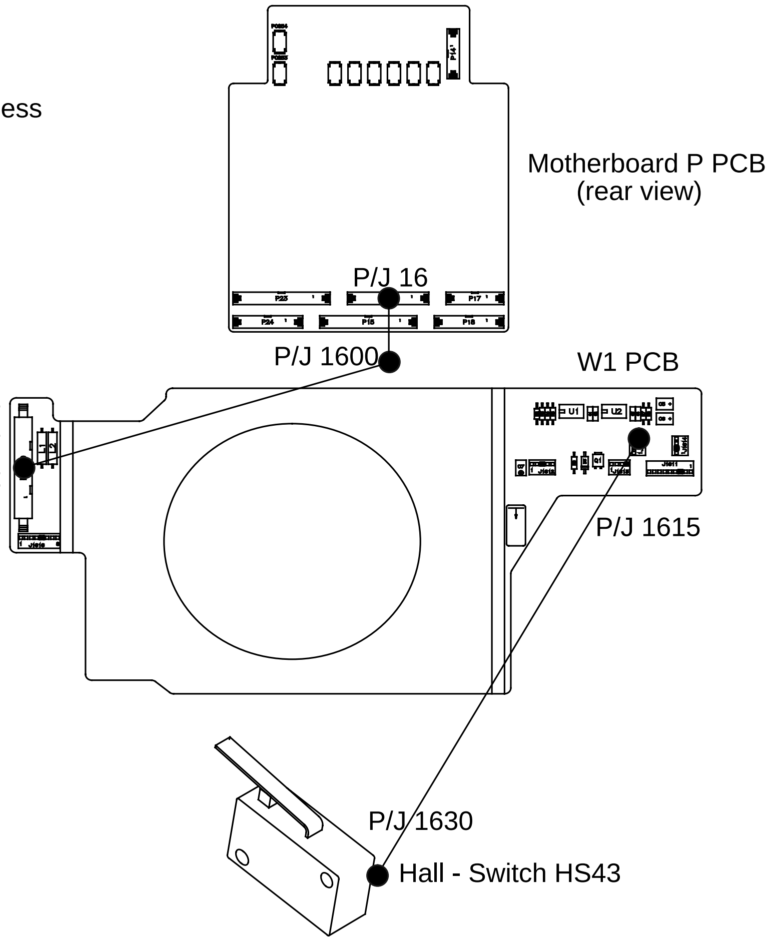
Module: End
Assembly: Reagent Drawer
Sensor: Hall - Switch HS42
Drawer End Position
Boards: W1, Step Motor PCB
Motherboard P
Error Message:


2
Step Motor PCB
W1
HS42


Motherboard P PCB
(rear view)
P/J 16
P/J 1600
W1 PCB
P/J 1610
P/J 1614
Hall - Switch HS42
P/J 1640

Module: End
Assembly: Reagent Drawer
Sensor: Hall - Switch HS43 Drawer Access
Boards: W1, Dispenser PCB
Motherboard P
Error Message:


3
Dispenser PCB
W1
HS43


Motherboard P PCB
(rear view)
P/J 16
P/J 1600
W1 PCB
P/J 1610
P/J 1615
P/J 1630
Hall - Switch HS43

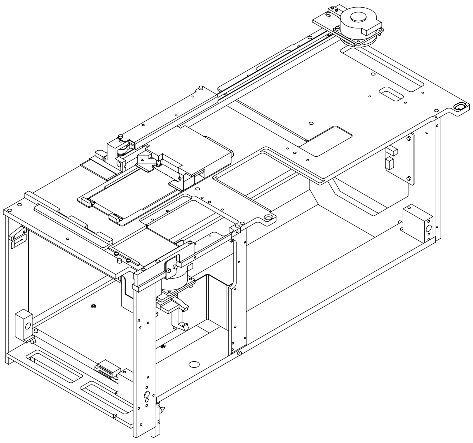
End Module Frame

147 593

- Functional Description
- Connector Boards

P1	146 158	
P7	146 269	
P8	146 271	
W8	146 209	(See W / D Frame)
W10	146 273	

- Wiring Diagram
- Replacing Spare Parts
- Spare Parts List
- 3D Drawing
- Troubleshooting

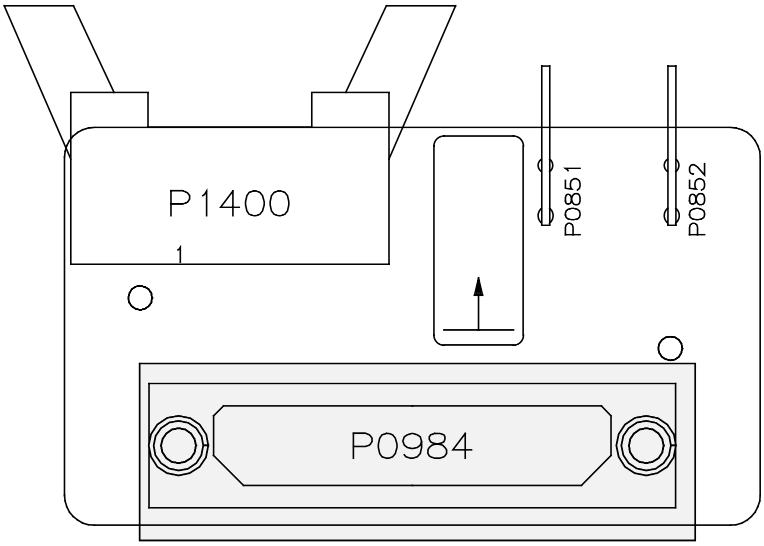


5.2 End Module Frame 147 593

5.2.1 Functional Description

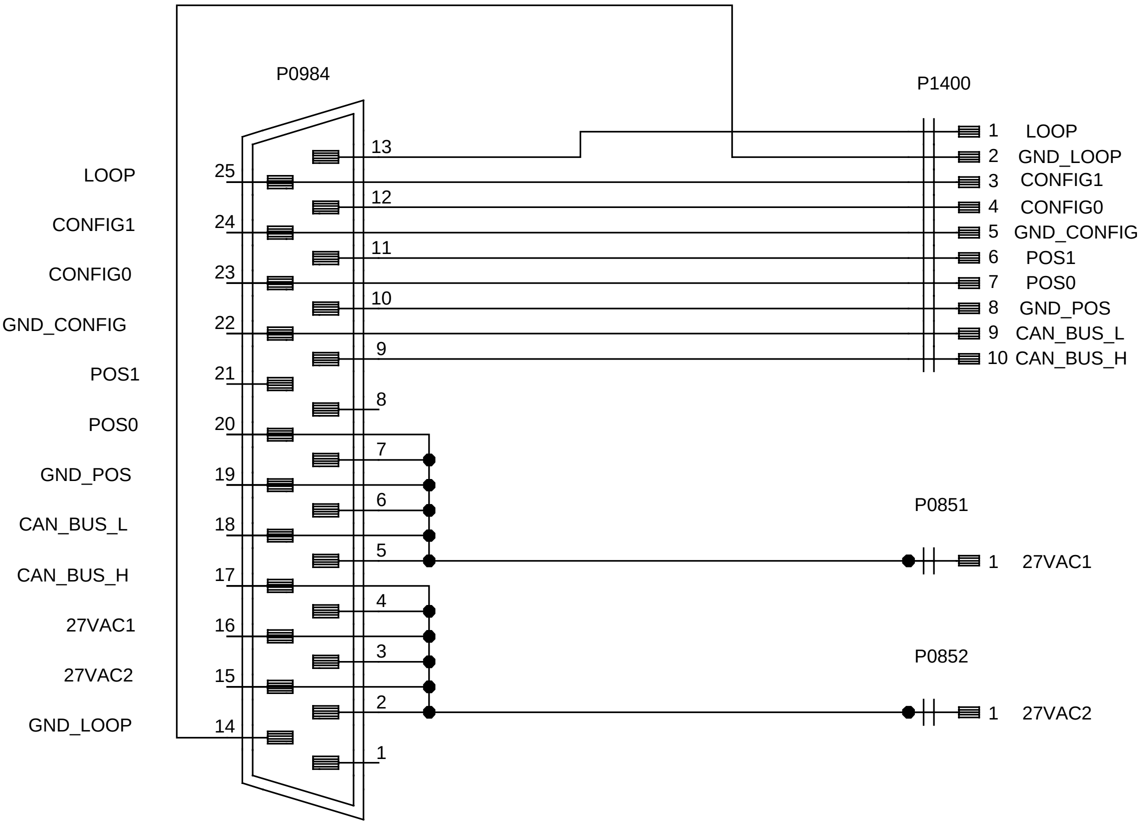
5.2.2 Connector Boards

Connector Board P1 PCB Component Layout 146.158 revision 00

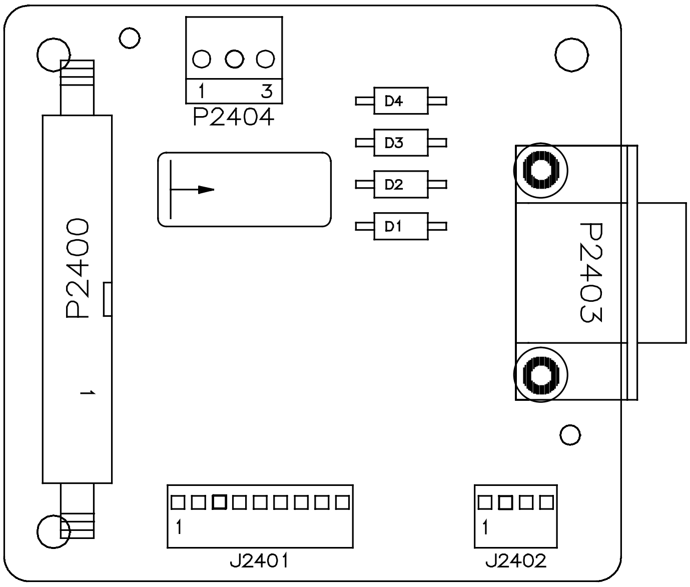

P1400
1
P0851
P0852
P0984

Connector Board P1 PCB Connection to Motherboard 2 Chassis PCB

604.794 revision 00

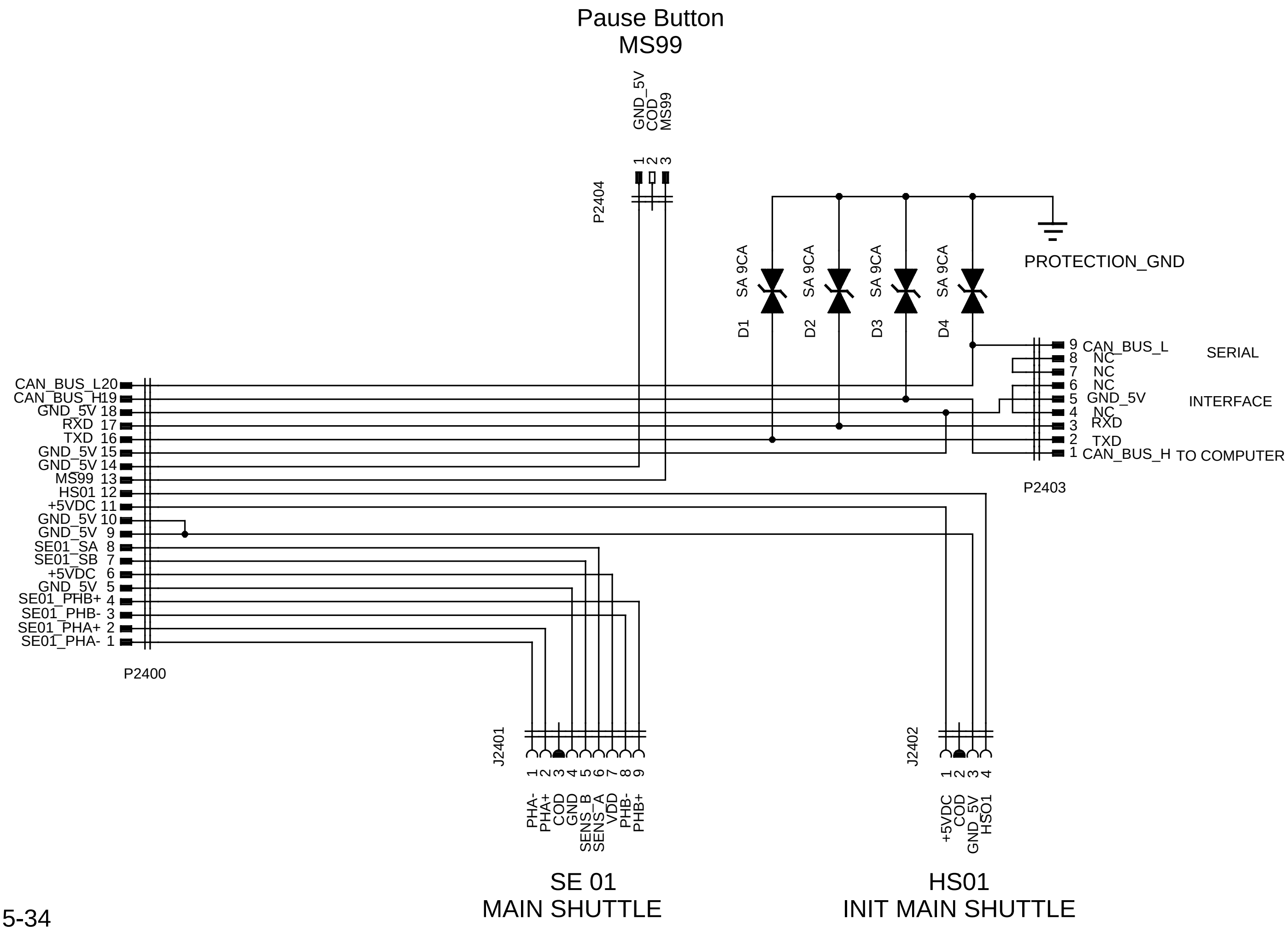

P0984
P1400
LOOP
CONFIG1
CONFIG0
GND_CONFIG
POS1
POS0
GND_POS
CAN_BUS_L
CAN_BUS_H
27VAC1
27VAC2
GND_LOOP
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1 LOOP
2 GND_LOOP
3 CONFIG1
4 CONFIG0
5 GND_CONFIG
6 POS1
7 POS0
8 GND_POS
9 CAN_BUS_L
10 CAN_BUS_H
P0851
1 27VAC1
P0852
1 27VAC2

Connector Board P7 PCB   Component Layout   146.269   revision 00

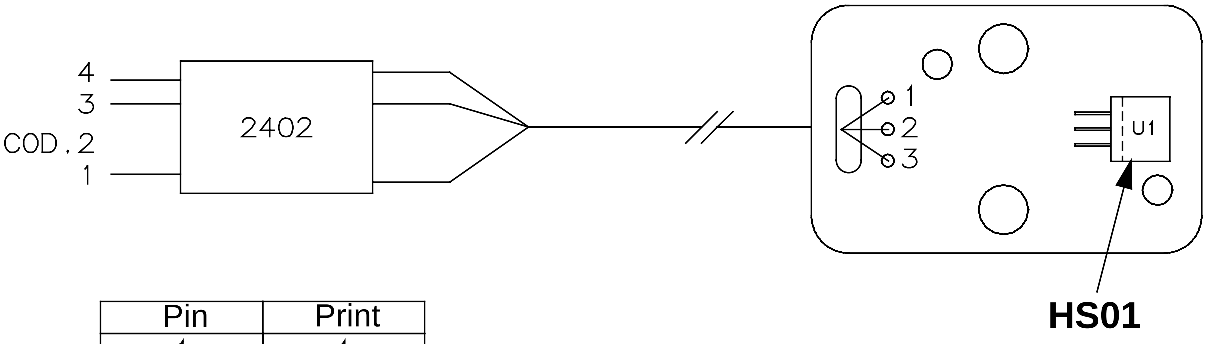

P2404
1
3
D4
D3
D2
D1
P2400
1
P2403
J2401
1
J2402
1

Connector Board P7 PCB   Main Shuttle, Pause Button, RS232

604.838   revision 01 (VD)


Pause Button
MS99
GND_5V
COD
MS99
1 2 3
P2404
SA 9CA
D1
SA 9CA
D2
SA 9CA
D3
SA 9CA
D4
PROTECTION_GND
9 CAN_BUS_L
8 NC
7 NC
6 NC
5 GND_5V
4 NC
3 RXD
2 TXD
1 CAN_BUS_H
SERIAL
INTERFACE
TO COMPUTER
P2403
CAN_BUS_L 20
CAN_BUS_H 19
GND_5V 18
RXD 17
TXD 16
GND_5V 15
GND_5V 14
MS99 13
HS01 12
+5VDC 11
GND_5V 10
GND_5V 9
SE01_SA 8
SE01_SB 7
+5VDC 6
GND_5V 5
SE01_PHB+ 4
SE01_PHB- 3
SE01_PHA+ 2
SE01_PHA- 1
P2400
J2401
1 2 3 4 5 6 7 8 9
PHA-
PHA+
COD
GND
SENS_B
SENS_A
VDD
PHB-
PHB+
J2402
1 2 3 4
+5VDC
COD
GND_5V
HSO1
SE 01
MAIN SHUTTLE
HS01
INIT MAIN SHUTTLE

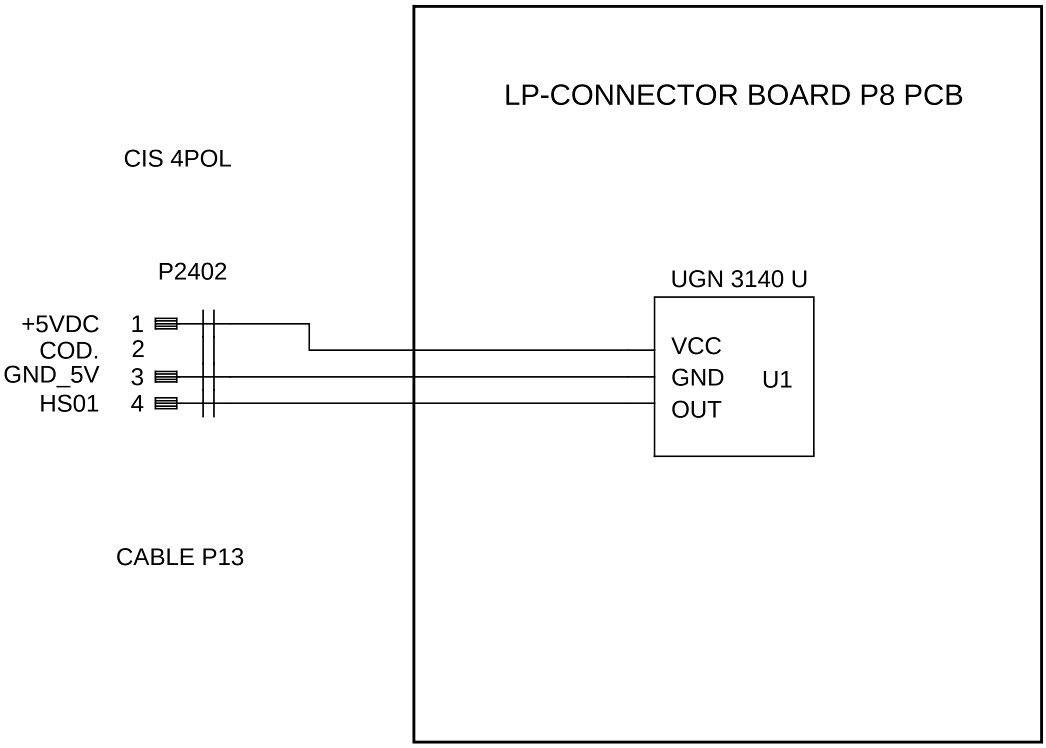
Connector Board P8 PCB Component Layout 146.271 revision 00


4
3
COD.2
1
2402
1
2
3
U1
HS01

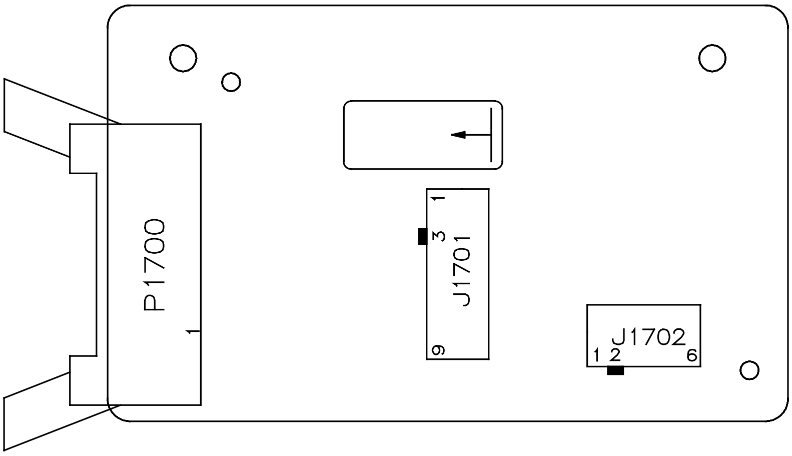
Pin	Print
1	1
2	–
3	2
4	3

Connector Board P8 PCB Main Shuttle Init. Sensor HS01

604.839 revision 00

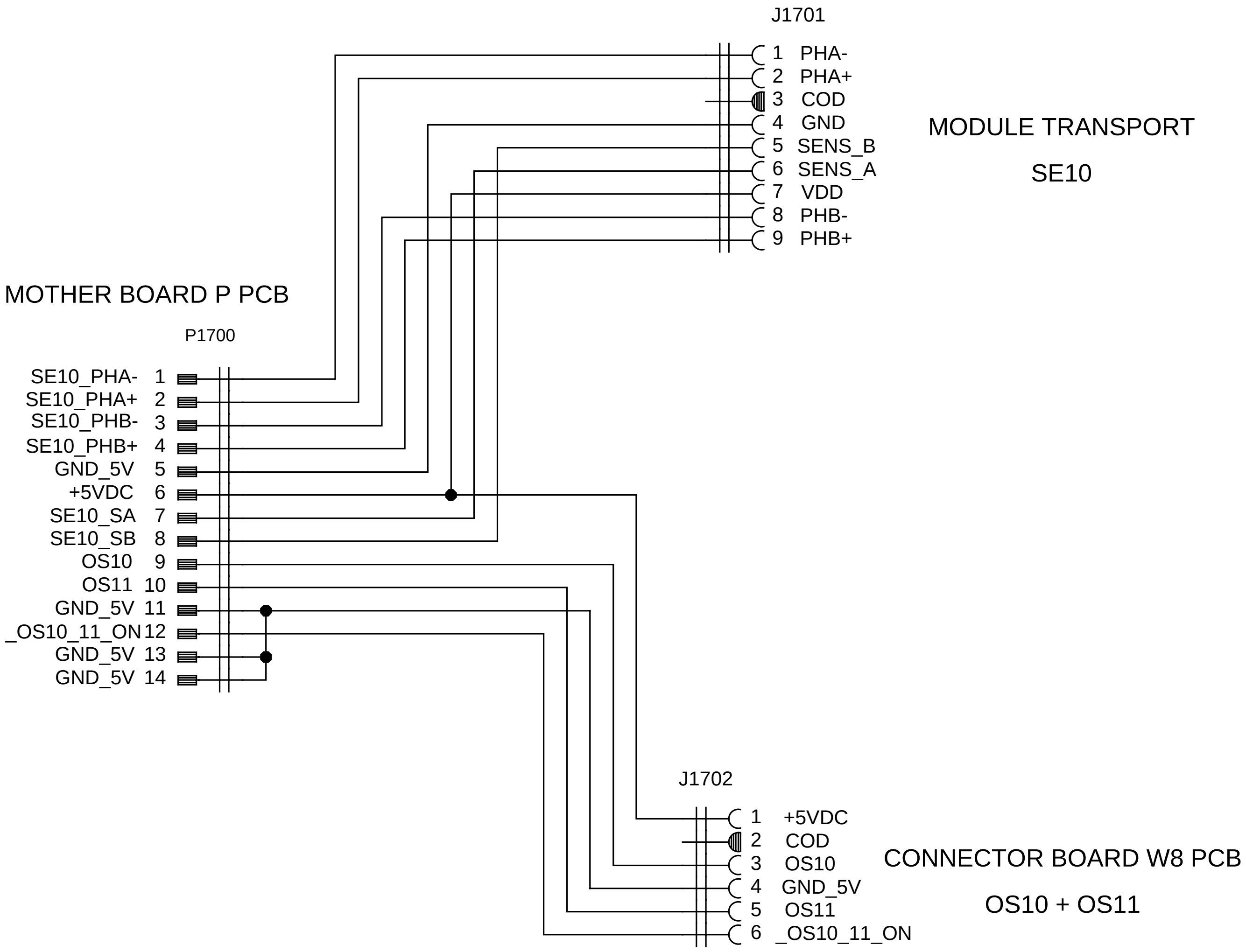

LP-CONNECTOR BOARD P8 PCB
CIS 4POL
P2402
UGN 3140 U
+5VDC 1
COD. 2
GND_5V 3
HS01 4
VCC
GND
OUT
U1
CABLE P13

Connector Board W10 PCB Component Layout 146.273 revision 00


P1700
1
1
3
J1701
9
J1702
1 2
6

Connector Board W10 PCB Module Transport SE10, OS10, OS11

604.840 revision 00


J1701
1 PHA-
2 PHA+
3 COD
4 GND
5 SENS_B
6 SENS_A
7 VDD
8 PHB-
9 PHB+
MODULE TRANSPORT
SE10
MOTHER BOARD P PCB
P1700
SE10_PHA- 1
SE10_PHA+ 2
SE10_PHB- 3
SE10_PHB+ 4
GND_5V 5
+5VDC 6
SE10_SA 7
SE10_SB 8
OS10 9
OS11 10
GND_5V 11
_OS10_11_ON 12
GND_5V 13
GND_5V 14
J1702
1 +5VDC
2 COD
3 OS10
4 GND_5V
5 OS11
6 _OS10_11_ON
CONNECTOR BOARD W8 PCB
OS10 + OS11

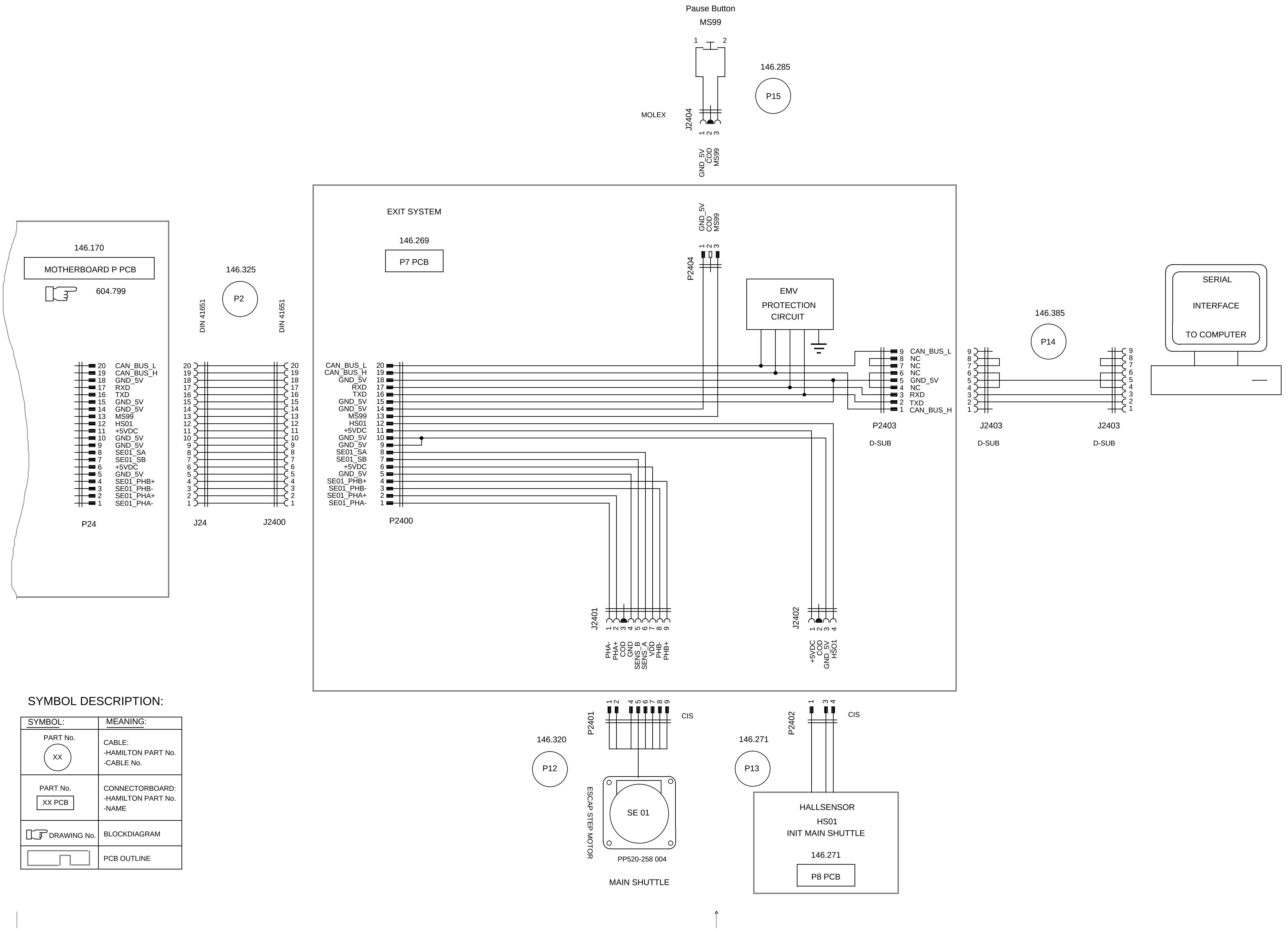
5.2.3 Wiring Diagram

Refer to the diagram on the next page:

- ❐ Exit System: Dwg No. 604 494

Wiring Diagram Exit System

604.494 revision 00 (VD)


Pause Button
MS99
1 2
146.285
P15
MOLEX
J2404
1 2 3
GND_5V COD MS99
EXIT SYSTEM
146.269
P7 PCB
P2404
EMV PROTECTION CIRCUIT
146.170
MOTHERBOARD P PCB
604.799
146.325
P2
DIN 41651
DIN 41651
20 CAN_BUS_L
19 CAN_BUS_H
18 GND_5V
17 RXD
16 TXD
15 GND_5V
14 GND_5V
13 MS99
12 HS01
11 +5VDC
10 GND_5V
9 GND_5V
8 SE01_SA
7 SE01_SB
6 +5VDC
5 GND_5V
4 SE01_PHB+
3 SE01_PHB-
2 SE01_PHA+
1 SE01_PHA-
P24
J24
J2400
P2400
9 CAN_BUS_L
8 NC
7 NC
6 NC
5 GND_5V
4 NC
3 RXD
2 TXD
1 CAN_BUS_H
P2403
D-SUB
146.385
P14
J2403
D-SUB
J2403
D-SUB
SERIAL INTERFACE TO COMPUTER
J2401
1 2 3 4 5 6 7 8 9
PHA- PHA+ COD GND SENS_B SENS_A VDD PHB- PHB+
J2402
1 2 3 4
+5VDC COD GND_5V HSO1
P2401
CIS
146.320
P12
ESCAP STEP MOTOR
SE 01
PP520-258 004
MAIN SHUTTLE
P2402
1 3 4
CIS
146.271
P13
HALLSENSOR
HS01
INIT MAIN SHUTTLE
146.271
P8 PCB

SYMBOL DESCRIPTION:

SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
DRAWING No.	BLOCKDIAGRAM
	PCB OUTLINE

5.2.4 Replacing spare parts

NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

5.2.4.1 Connector board P1 PCB item 1

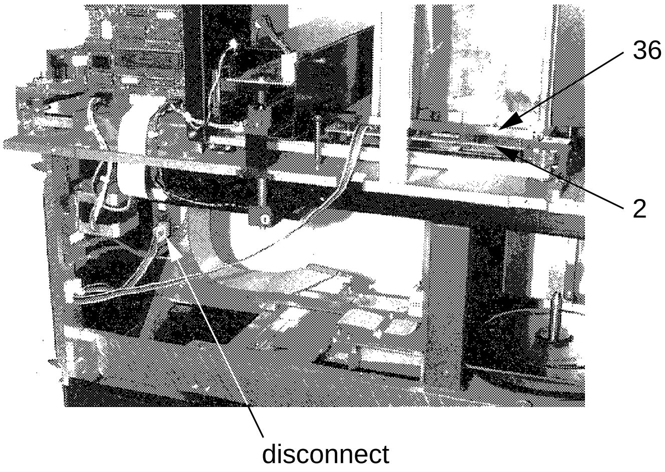
Remove *rear panel item 88* (see section 5.1.5).

Unscrew connector board P1 from module frame, disconnect cables and replace.

5.2.4.2 Connector board W8 PCB item 2

Remove *hood item 82* and *side cover left item 83* (see section 5.1.5).

Disconnect connector 1702 on connector board W10, free cable from cable clamps.



Unscrew *connector board W8 support item 36* complete with connector board W8 (2 screws).

Unscrew connector board W8 from connector board W8 support and replace.

After replacing, carry out module transport calibration (see section 1.1.4.3.17):

click check box ☑ Dispenser

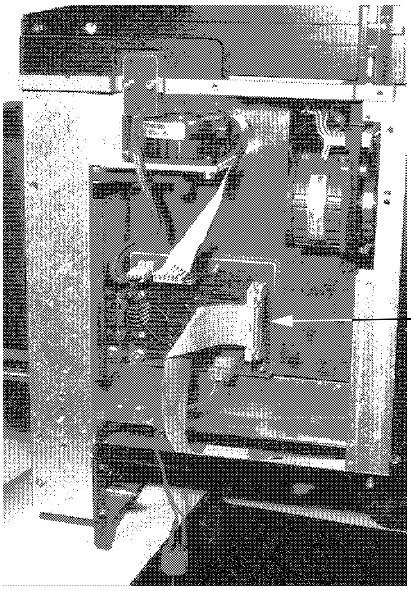
5.2.4.3 Connector board P7 PCB item 3

Remove *side cover right front item 85* (see section 5.1.5).

Unscrew the connector (socket) in module front.

Disconnect all cables from connector board P7.

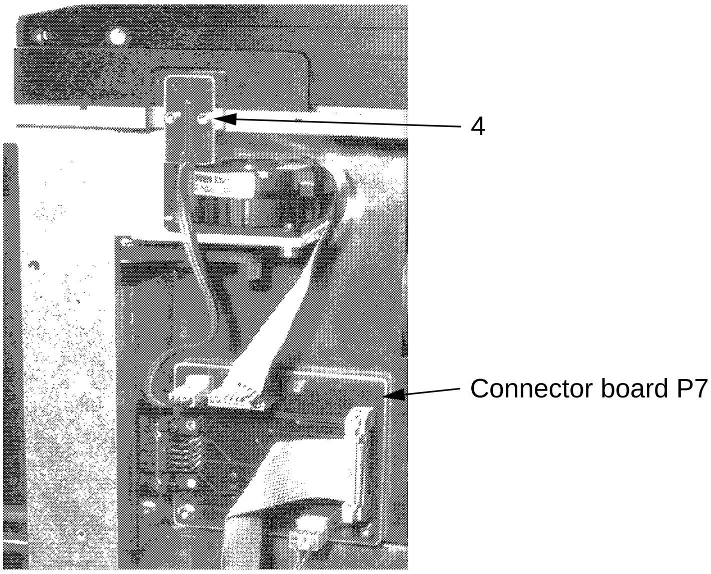
Unscrew (3 screws) and replace connector board P7.



5.2.4.4 Connector board P8 PCB item 4

Remove *side cover right front item 85* (see section 5.1.5).

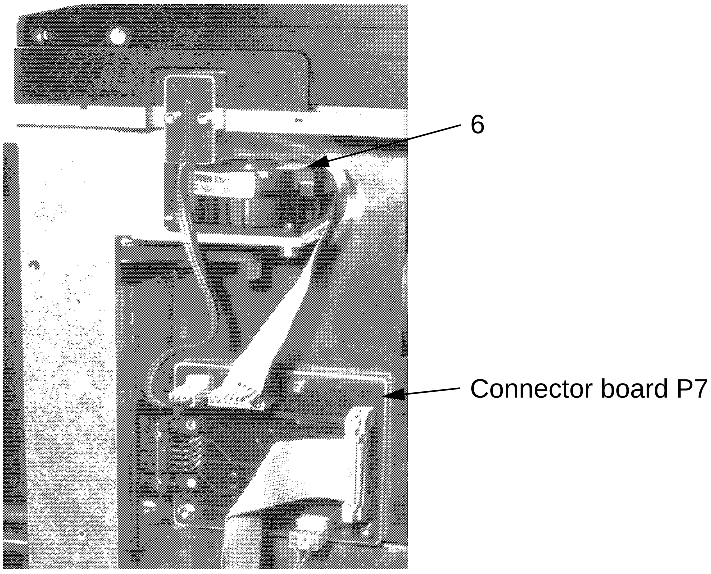
Disconnect connector board P8 on connector board P7 item 3, unscrew and replace.



5.2.4.5 Step motor P SE01 item 6

Remove *side cover right front item 85* (see section 5.1.5).

Disconnect step motor on connector board P7. Unscrew step motor (2 screws) and replace.



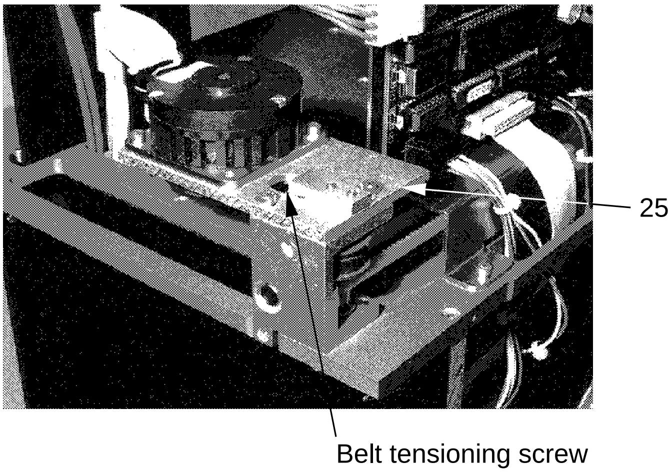
Belt tension:see section 5.2.4.9 Gear belt item 83 (main shuttle drive)

5.2.4.6 Step motor W SE10 item 7

Remove *hood item 82* and *side cover right rear item 84* (see section 5.1.5).

Disconnect motor on connector board W10.

Slacken belt by first unfastening *motor support plate item 25* (2 screws) and the belt tensioning screw.



Slip the belt off the motor pulley.

Unscrew the motor from the motor support plate and replace.

Belt tension:see section 5.2.4.8 Gear belt item 83 (module transport)

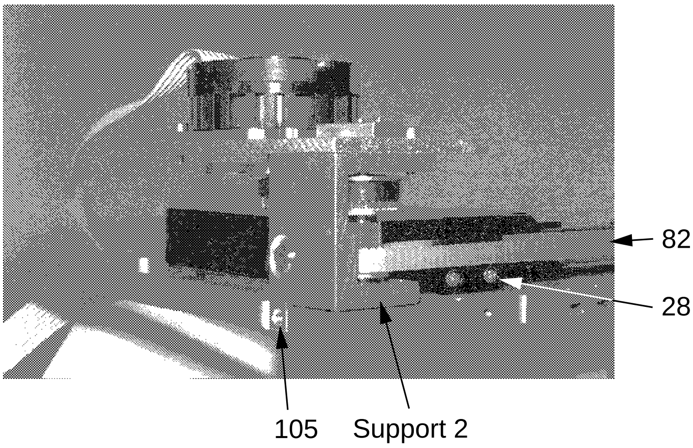
5.2.4.7 Gear belt item 82

Remove *hood item 82* (see section 5.1.5).

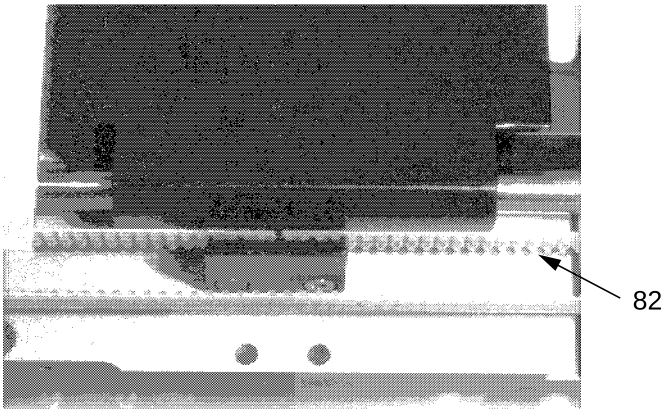
Push the module transport to the back.

Loosen the belt clamp item 28 (2 screws) and remove the belt.

Now slacken the support 2 fixing screw item 103 (from underneath) and the belt tensioning screw item 105.

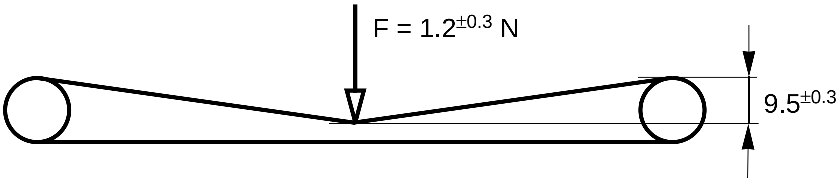


Install the new belt. Clamp as much of the belt ends as possible, see following picture:



Tighten the belt using the belt tensioning screw item 105, then tighten the support 2 fixing screw item 103.

Belt tension:

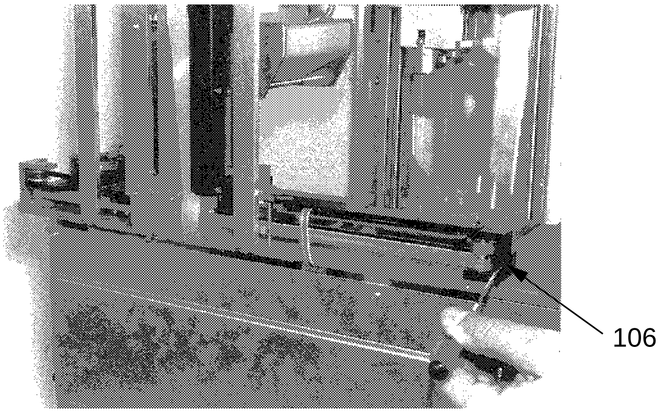


5.2.4.8 Gear belt item 83 (module transport)

Remove *hood item 82* (see section 5.1.5).

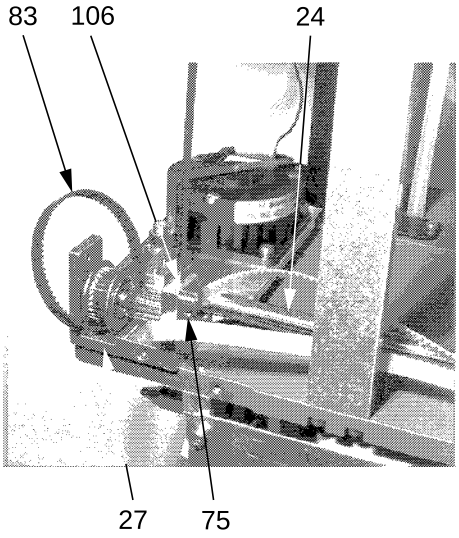
Unscrew the *motor support plate item 25* (2 screws).

Slacken the guide shaft 2 fixing screw item 106 and push the *guide shaft 2 item 24* approx. 10 mm ($^1/_2$") to the front.



Unscrew *support 2 item 27* (1 screw from underneath).

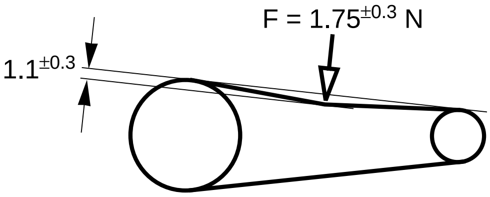
Slacken the set screw locking the *shaft item 75* and push out the shaft, replace the gear belt.



Remounting:

Make sure the *shaft item 75* is flush with the bottom of *support 2 item 27* and *guide shaft 2 item 24* in front with *support 1 item 26* (shaft must not stick out!).

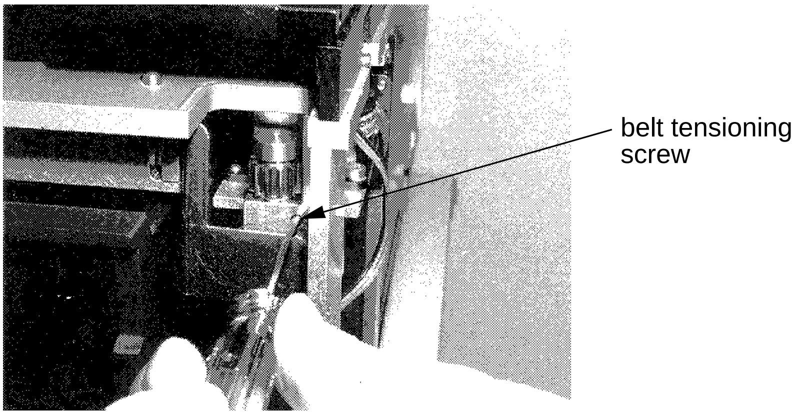
Belt tension:



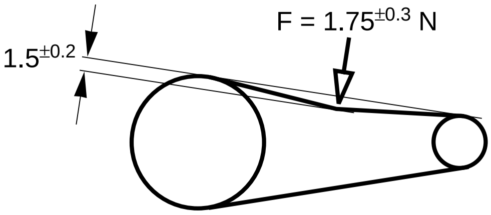
5.2.4.9 Gear belt item 83 (main shuttle drive)

Remove *side cover right front item 85* (see section 5.1.5).

Loosen step motor item 6 mounting screws, slacken belt by turning belt tensioning screw and replace belt.


belt tensioning screw

Belt tension:


F = $1.75^{\pm0.3}$ N
$1.5^{\pm0.2}$

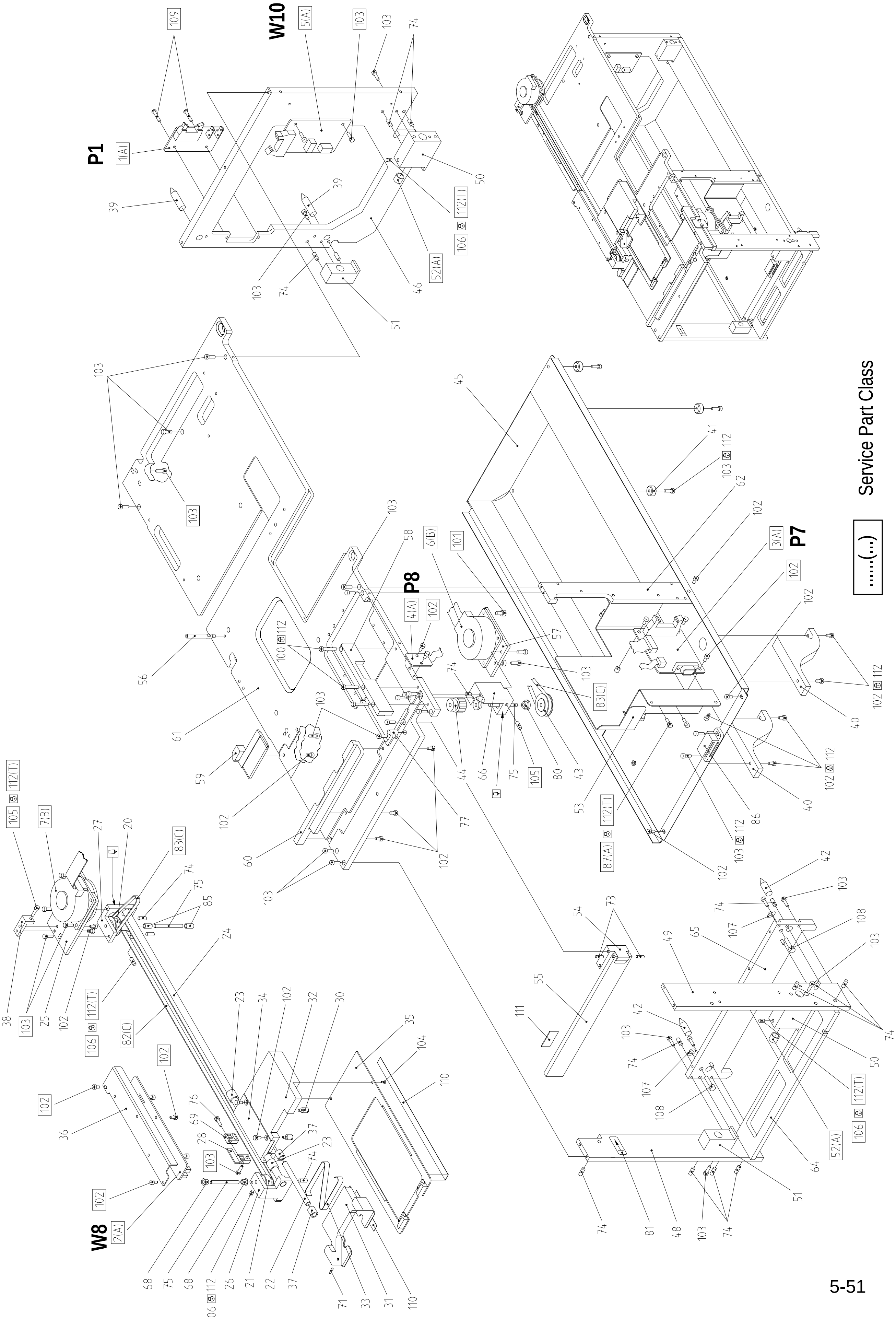
5.2.5 Spare Parts List

END MODULE FRAME 147593 Revision: 01

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
146158	CONNECTORBOARD P1 PCB	00	1	1.000	A
146209	CONNECTORBOARD W8 PCB	00	2	1.000	A
146269	CONNECTORBOARD P7 PCB	00	3	1.000	
146271	CONNECTORBOARD P8 PCB	00	4	1.000	A
146273	CONNECTORBOARD W10 PCB	00	5	1.000	A
146320	STEP MOTOR P SE01	00	6	1.000	B
146371	STEP MOTOR W SE10	00	7	1.000	B
147191	ZAHNRIEMENRAD 1	00	20	1.000	
147193	RITZEL 2	00	21	1.000	
147198	FUEHRUNGSWELLE 1	00	22	1.000	
148371	GLEITLAGER 2 BEARB.	00	23	2.000	
148375	FUERUNGSWELLE 2	00	24	1.000	
147201	MOTORPLATTE	00	25	1.000	
148379	SUPPORT 1	00	26	1.000	
148380	SUPPORT 2	00	27	1.000	
148372	KLEMMSTUECK	00	28	1.000	
147206	ANSCHLAG	00	30	2.000	
148376	SCHLITTEN UNTERTEIL	00	31	1.000	
148367	SCHLITTEN OBERTEIL	00	32	1.000	
147209	BLATTFEDER	00	33	1.000	
148368	SCHLITTENFUEHRUNG	00	34	1.000	
148370	GRUNDBLECH KPL.	00	35	1.000	
147212	TRAGBLECH BOARD W8	00	36	1.000	
147215	GLEITLAGER 1 BEARBEITET	00	37	2.000	
147216	WINKEL	00	38	1.000	
147336	POSITIONIERSTIFT HINTEN	00	39	2.000	
147345	KUFE	00	40	2.000	
147346	ANSCHLAG HINTEN	00	41	3.000	
147348	POSITIONIERSTIFT VORNE	00	42	2.000	
147568	RIEMENRITZEL Z=38	00	43	1.000	
147569	ZAHNRAD z=12, m=1.25	01	44	1.000	
147574	BODEN END	00	45	1.000	
147575	R<CKWAND	00	46	1.000	
147577	TRAEGER 1	01	48	1.000	
147578	TRAEGER 2	00	49	1.000	
147580	SUPPORT 3	00	50	2.000	
147579	SUPPORT 4	00	51	2.000	
147581	JUSTIERSCHEIBE	00	52	2.000	A
147582	CONNECTORBLECH	00	53	1.000	
147583	SCHARNIER 2	00	54	1.000	
147584	BEGRENZLEISTE 2	01	55	1.000	
147585	DISTANZBOLZEN	00	56	1.000	
147586	MOTORPLATTE 2	00	57	1.000	
147589	SENSORSCHUTZ	00	58	1.000	
147590	GLEITBAHN 7	00	59	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147591	FUEHRUNGSLEISTE 4	00	60	1.000	
147594	BASISPLATTE	00	61	1.000	
147595	TRAEGER 3	00	62	1.000	
148179	GRIFFPLATTE 1	00	64	1.000	
148217	MODULTRfGER 3	00	65	1.000	
148218	LAGERBOCK	00	66	1.000	
148258	FLANSCHBUECHSE	00	68	2.000	
148369	SPANNSTUECK	00	69	1.000	
251901	ZYL-STIFT 2 X 5 VSM12771B	00	70	4.000	
251031	ZYL-STIFT 2,0X 6 DIN6325	00	71	1.000	
279250	ZYL-STIFT 3.0X10 VSM12771B	00	73	2.000	
251932	ZYL.STIFT 4 X10 VSM12771B	00	74	18.000	
251939	ZYL-STIFT 4 X40 VSM12771B	00	75	3.000	
420314	ZYL-SCHR.M 3X20 DIN912 A2	00	76	1.000	
259954	ZYL-STIFT 6 X12 VSM12771B	00	77	1.000	
253015	SINERBZ.LAGER 4E7/ 8r7/12 4+2	00	80	2.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	81	1.000	
258065	ZAHNRIEMEN SYN-FLEX Z=362X6	00	82	1.000	C
258066	ZAHNRIEMEN MXL Z= 79 X 3/16”	00	83	2.000	C
279356	GLEITLAGER ZYL. 4X 5,5 X10	00	85	2.000	
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	86	1.000	C
369038	VERRIEGELUNGSMUTTER	00	87	2.000	B
400265	ZYL-SCHR.M 3X12 DIN912 A2	00	99	1.000	
400009	ZYL-SCHRAUBE M 3 X20 DIN912	00	100	3.000	
400024	ZYL-SCHRAUBE M 4 X 8 DIN912	00	101	2.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	102	28.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	103	39.000	
403212	SENKSCHRAUBE M2 X 5 DIN963A	00	104	2.000	
405225	GEW.STIFT M 4X10 VERZ DIN914	00	105	2.000	
405462	GEW.STIFT M4 X 5 VERZ DIN916	00	106	3.000	
413045	RINGFEDER SCHWARZ NR.5 BN816	00	107	2.000	
420074	ZYL-SCHR.M 4X16 DIN912 A2	00	108	2.000	
420331	LINSENSCHR M3 X16 ISO7380	00	109	2.000	
7281149	PTFE-KLEBEBAND EXTR.B=9MM	00	110	0.210	
7279373	KLEBBAND 1-SEITIG D=2MM,B=19MM	00	111	0.030	
511006	LOCTITE 222 50mL	00	112	0.000	T

5.2.6 3D Drawing End Module Frame: Dwg. 147 593 revision 03

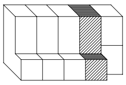

109
W10
5(A)
103
103
74
P1
1(A)
39
39
50
112(T)
106 112(T)
52(A)
46
103
74
51
103
103
56
61
45
41
103 112
62
102
3(A)
P7
102
102
103
58
6(B)
101
P8
4(A)
102
100 112
57
103
74
83(C)
59
103
102
44
66
75
105
80
43
77
60
102
103
53
112(T)
87(A) 112
86
103 112
40
102 112
40
102 112
102
105 112(T)
7(B)
27
20
83(C)
74
75
85
24
38
103
25
102
106 112(T)
82(C)
102
102
36
23
34
102
32
30
35
104
110
76
69
28
103
37
23
74
102
W8
2(A)
68
75
68
106 112
26
21
22
37
71
33
31
110
54
73
55
111
42
103
74
107
108
103
49
65
42
103
74
107
108
50
74
106 112(T)
52(A)
64
51
74
81
48
103
74

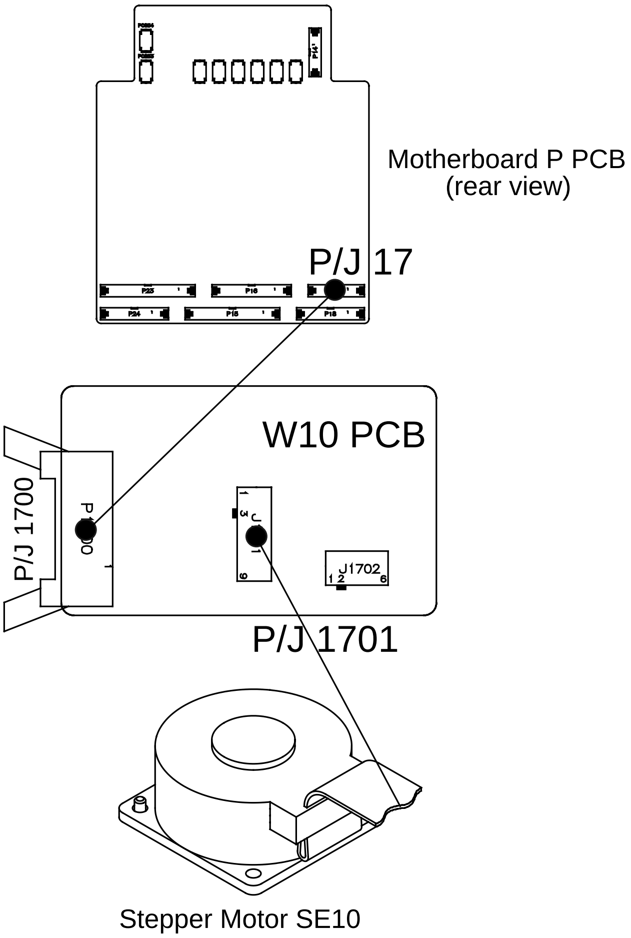
Service Part Class

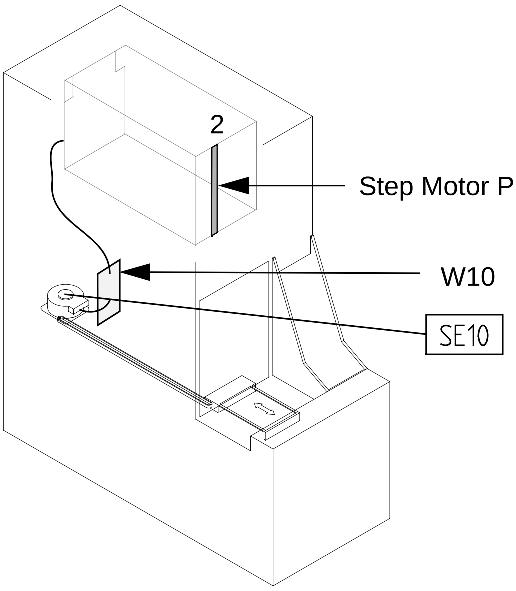
......(...)

5.2.7 Troubleshooting

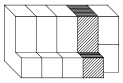
Module: End
Assembly: End Module Frame
Actor: Stepper Motor with integrated Encoder
SE10 Module Transport
Boards: W10, Step Motor PCB
Motherboard P
Error Message:

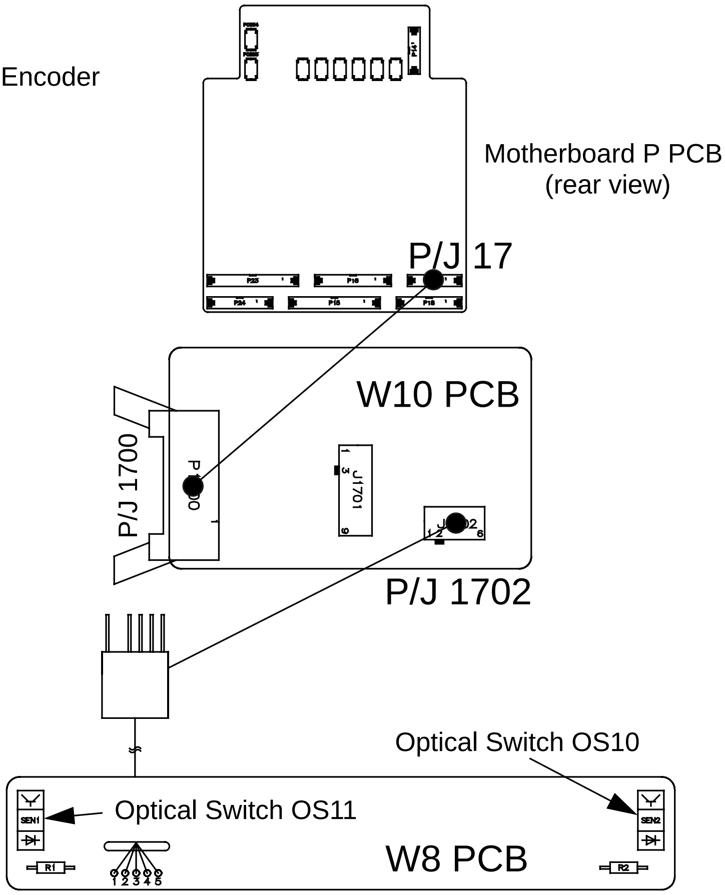


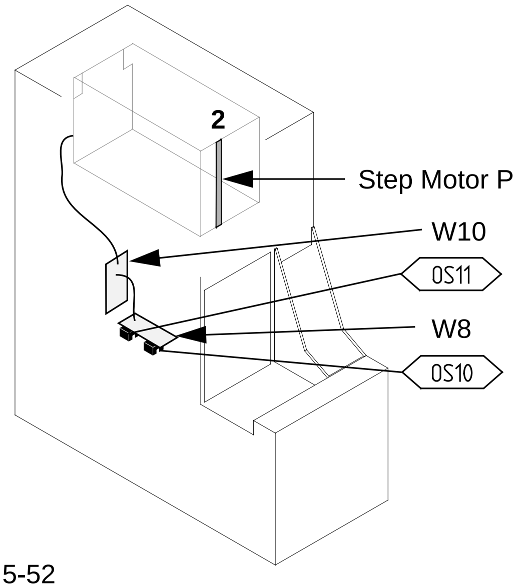

Motherboard P PCB
(rear view)
P/J 17
W10 PCB
P/J 1700
J1702
P/J 1701
Stepper Motor SE10


2
Step Motor PCB
W10
SE10

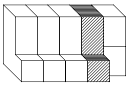
Module: End
Assembly: End Module Frame
Actor: Stepper Motor with integrated Encoder
SE10 Module Transport
Boards: W10, Step Motor PCB
Motherboard P
Error Message:

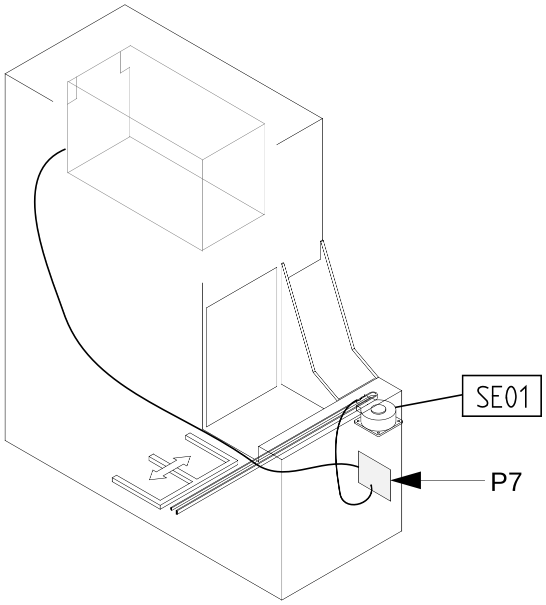


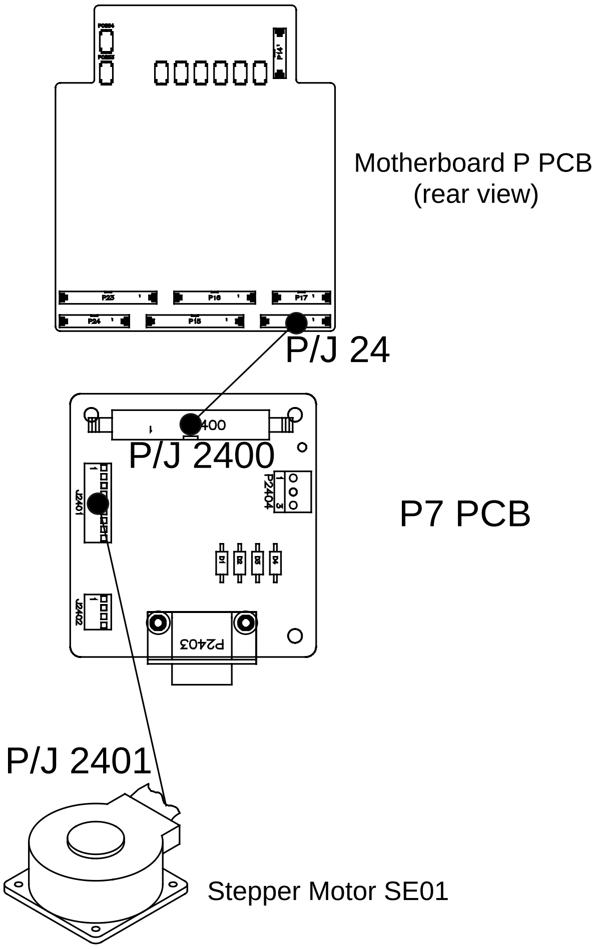

Motherboard P PCB
(rear view)
P/J 17
W10 PCB
P/J 1700
J1701
P/J 1702
Optical Switch OS10
Optical Switch OS11
SEN1
SEN2
R1
R2
1 2 3 4 5
W8 PCB


2
Step Motor PCB
W10
OS11
W8
OS10

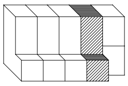
Module: End
Assembly: End Module Frame
Actor: Stepper-Motor with integrated Encoder
SE01 Main Shuttle
Boards: P7, Motherboard P
Error Message:

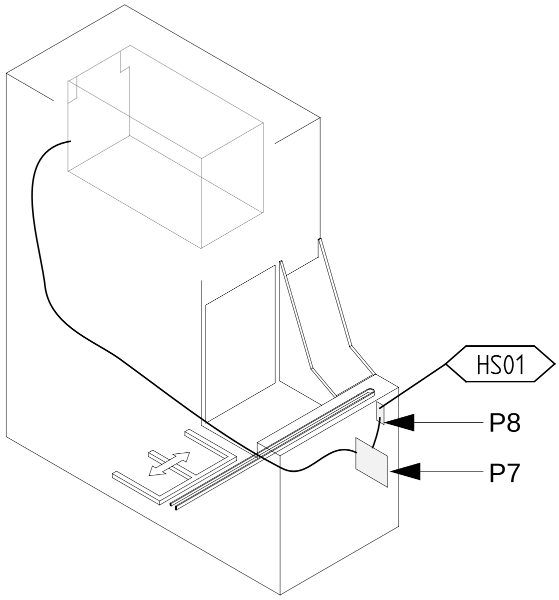


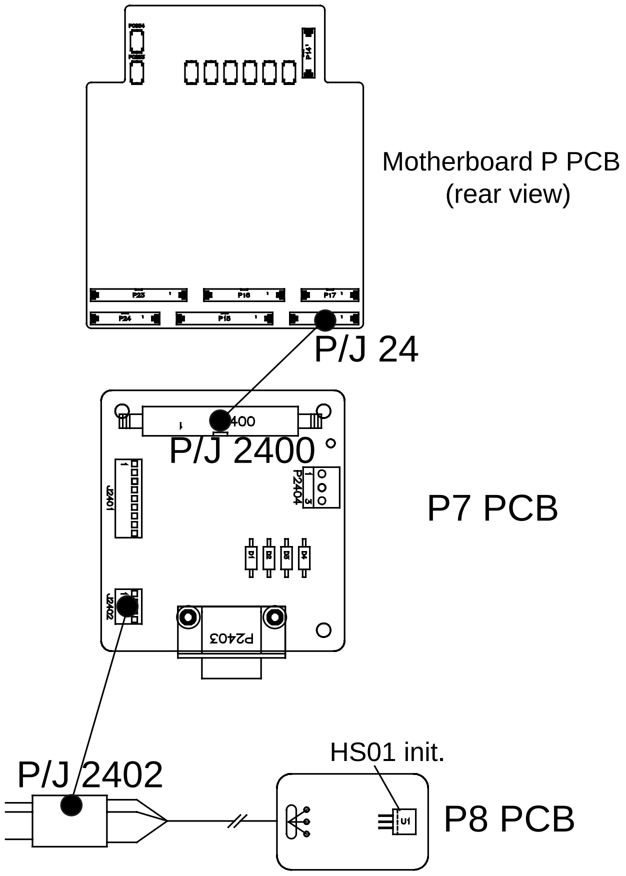



Motherboard P PCB
(rear view)
P23
P16
P17
P24
P15
P/J 24
P/J 2400
J2401
J2402
P2404
D1
D2
D3
D4
P2403
P7 PCB
P/J 2401
Stepper Motor SE01

Module: End
Assembly: End Module Frame
Sensor: Hall-Switch HS01
Initialization Main Shuttle
Boards: P7, P8, Motherboard P
Error Message:






Motherboard P PCB
(rear view)
P23
P16
P17
P24
P15
P/J 24
P/J 2400
J2401
J2402
P2404
D1
D2
D3
D4
P2403
P7 PCB
P/J 2402
HS01 init.
U1
P8 PCB

Built-in Photometer

147 254

- Functional Description
- Connector Board
  - P20 146 244
- Wiring Diagram
- Replacing Spare Parts
- Spare Parts List
- Troubleshooting

5.3 Built-in Photometer 147 254

5.3.1 Functional Description

The photometer has 8 measuring channels (i.e. 8 wells can be measured simultaneously) and one reference channel. The filter case is delivered with the 5 filters below:

- ❐ 340 nm
- ❐ 405 nm
- ❐ 450 nm
- ❐ 492 nm
- ❐ 620 nm

Up to 8 filters may be installed with wavelengths ranging from 340 nm to 750 nm.

5.3.2 Connector Boards

- ❒ Connector Board P20 (Optical Switch OS60 for Filter Case)
- ❒ Photometer Processor PCB
- ❒ Lamp Controller PCB
- ❒ Lamp Assy PCB
- ❒ A/D Converter PCB

See section 5.3.3 Wiring Diagram.

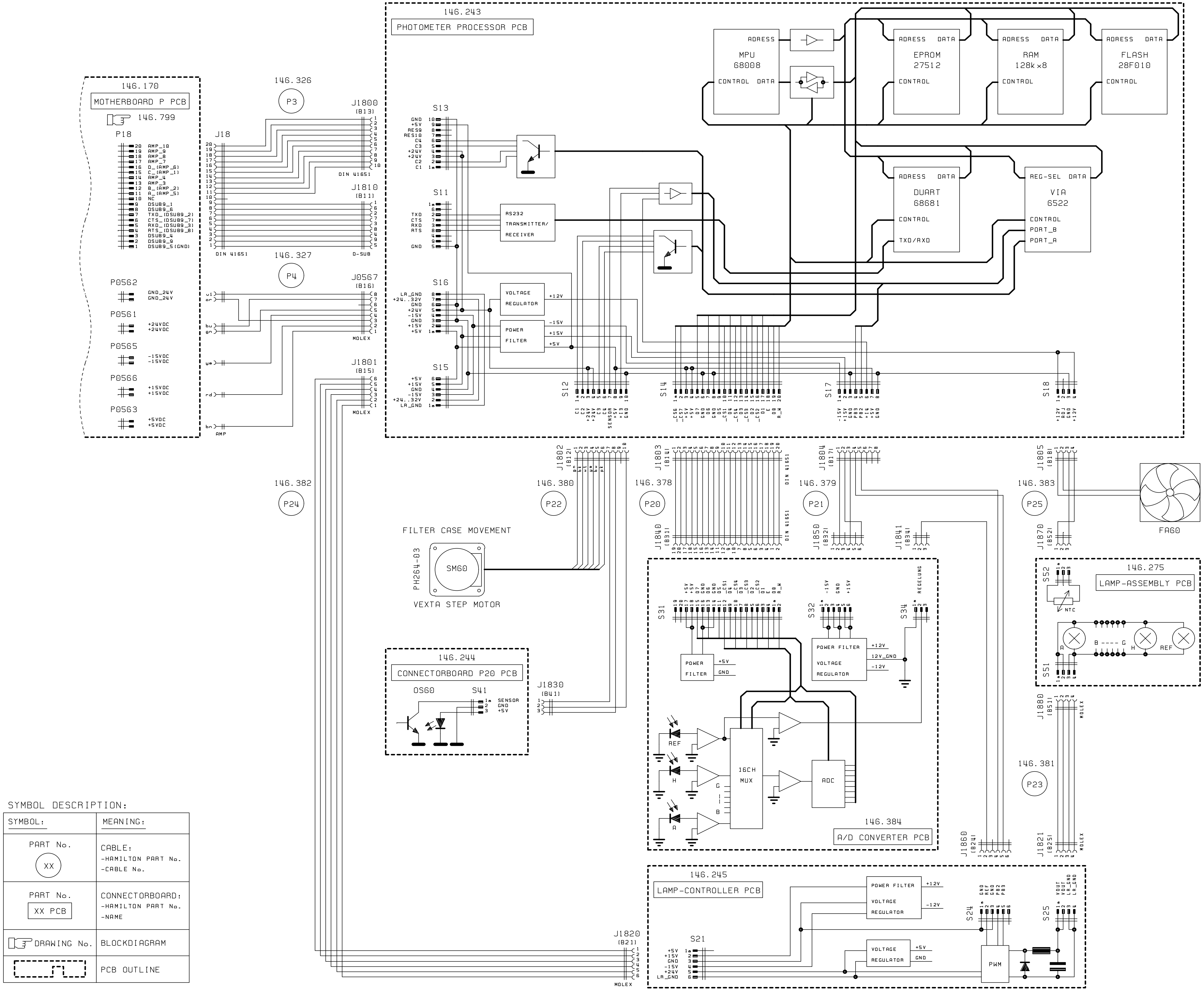
5.3.3 Wiring Diagram

Refer to the drawing on the following page:

- ❒ Wiring Diagram Photometer: Dwg No. 604 489

Wiring Diagram Photometer

604.489 revision 01


146.243
PHOTOMETER PROCESSOR PCB
MPU 68008
ADRESS
CONTROL DATA
EPROM 27512
RAM 128k x8
FLASH 28F010
DUART 68681
TXD/RXD
REG-SEL DATA
VIA 6522
PORT_B
PORT_A
RS232 TRANSMITTER/ RECEIVER
VOLTAGE REGULATOR
POWER FILTER
+12V
-15V
+15V
+5V
S13
S11
S16
S15
S12
S14
S17
S18
146.170
MOTHERBOARD P PCB
146.799
P18
AMP_10
AMP_9
AMP_8
AMP_7
D_(AMP_6)
C_(AMP_1)
AMP_4
AMP_3
B_(AMP_2)
A_(AMP_5)
NC
DSUB9_1
DSUB9_6
TXD_(DSUB9_2)
CTS_(DSUB9_7)
RXD_(DSUB9_3)
RTS_(DSUB9_8)
DSUB9_4
DSUB9_9
DSUB9_5(GND)
P0562
GND_24V
P0561
+24VDC
P0565
-15VDC
P0566
+15VDC
P0563
+5VDC
J18
DIN 41651
146.326
P3
146.327
P4
J1800
(B13)
J1810
(B11)
D-SUB
J0567
(B16)
MOLEX
J1801
(B15)
AMP
146.382
P24
146.380
P22
146.378
P20
146.379
P21
146.383
P25
J1802
(B12)
J1803
(B14)
J1804
(B17)
J1805
(B18)
J1840
(B31)
J1850
(B32)
J1841
(B34)
J1870
(B52)
FA60
FILTER CASE MOVEMENT
PH264-03
SM60
VEXTA STEP MOTOR
146.244
CONNECTORBOARD P20 PCB
OS60
S41
SENSOR
GND
+5V
J1830
(B41)
S31
S32
S34
REGELUNG
POWER FILTER
VOLTAGE REGULATOR
12V_GND
-12V
REF
H
G
B
A
16CH MUX
ADC
146.384
A/D CONVERTER PCB
146.275
LAMP-ASSEMBLY PCB
S52
NTC
S51
B ---- G
146.381
P23
J1880
(B51)
J1860
(B24)
J1821
(B25)
146.245
LAMP-CONTROLLER PCB
S21
S24
S25
PWM
VOUT
LA_GND
J1820
(B21)

SYMBOL DESCRIPTION:

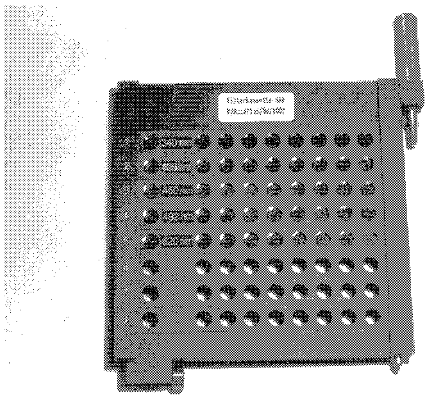
SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
DRAWING No.	BLOCKDIAGRAM
	PCB OUTLINE

5.3.4 Replacing Spare Parts

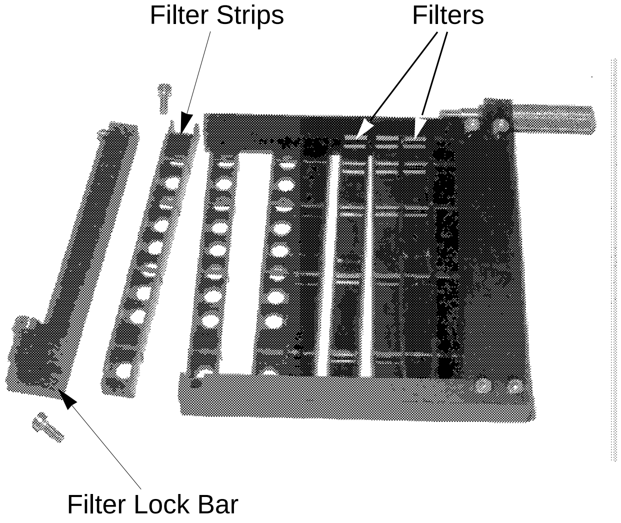
NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

5.3.4.1 Filter case p/n 147 256, filter strip p/n 235 524

For removing of filter case refer to section 1.1.5.1.1.



Unscrew filter lock-bar and change / add / remove filters. Note that the combined total of filters and filter strips must always be eight (8).



ATTENTION
The filters installed must be defined in the software! See User Manual section 9.2.3.

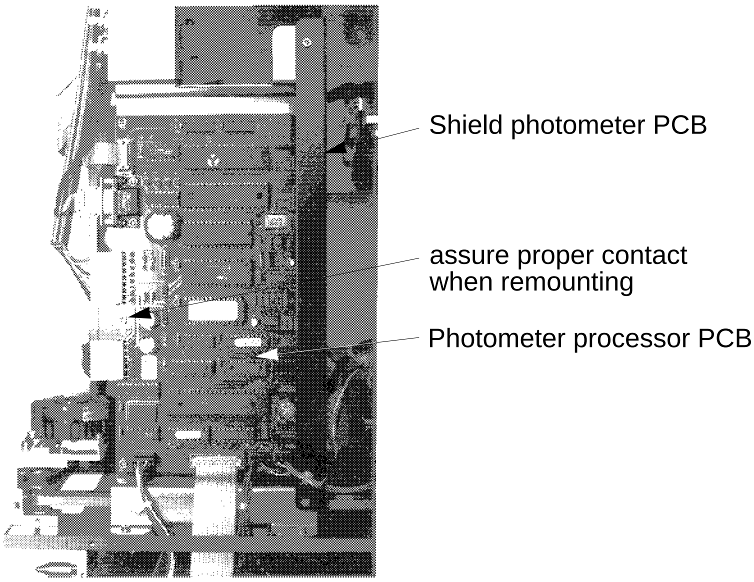
5.3.4.2 Photometer processor PCB p/n 146 243

Remove *hood item 82* (see section 5.1.5).

Disconnect all connectors on photometer processor PCB.

Unscrew shield photometer PCB.

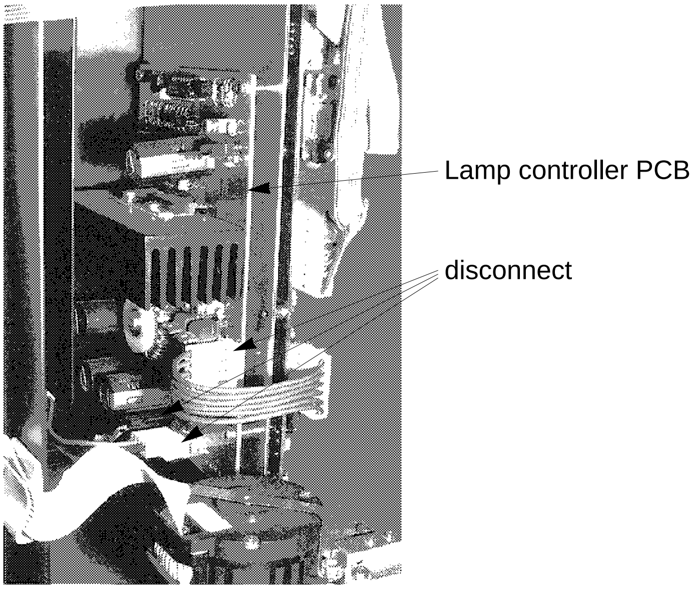
Unscrew and replace photometer processor PCB.


Shield photometer PCB
assure proper contact when remounting
Photometer processor PCB

5.3.4.3 Lamp controller PCB p/n 146 245

Remove *hood item 82* (see section 5.1.5).

Disconnect the three connectors on lamp controller PCB, unscrew and replace it.


Lamp controller PCB
disconnect

5.3.4.4 Lamp-assembly PCB p/n 146 275

ATTENTION
Do NOT TOUCH the lamps of the new lamp-assy PCB.

The End module does not need to be taken off the chassis in order to replace the lamp-assy PCB.

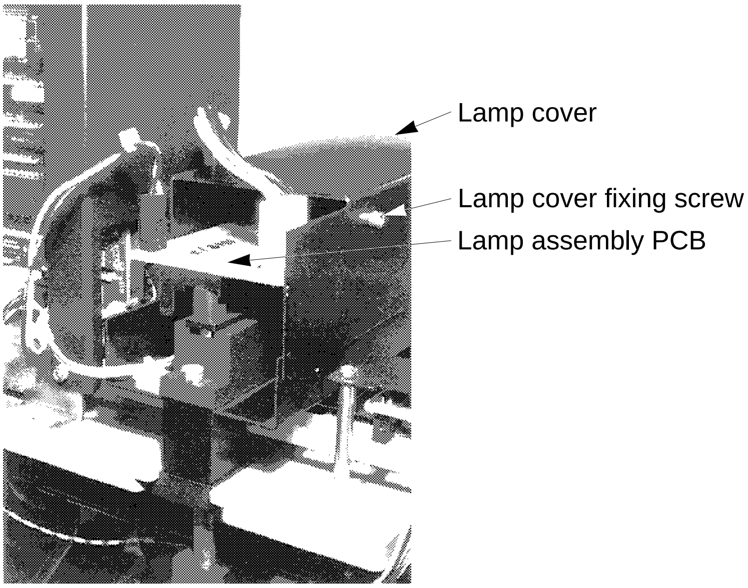
Remove the container stack (see section 1.1.5.3.1).

Remove access plate (4 screws) on side of hood.

Unscrew (1 screw) and lift off lamp cover.

Disconnect the two cables on lamp-assy PCB.

Unscrew (2 screws) and replace lamp-assy PCB.


Lamp cover
Lamp cover fixing screw
Lamp assembly PCB

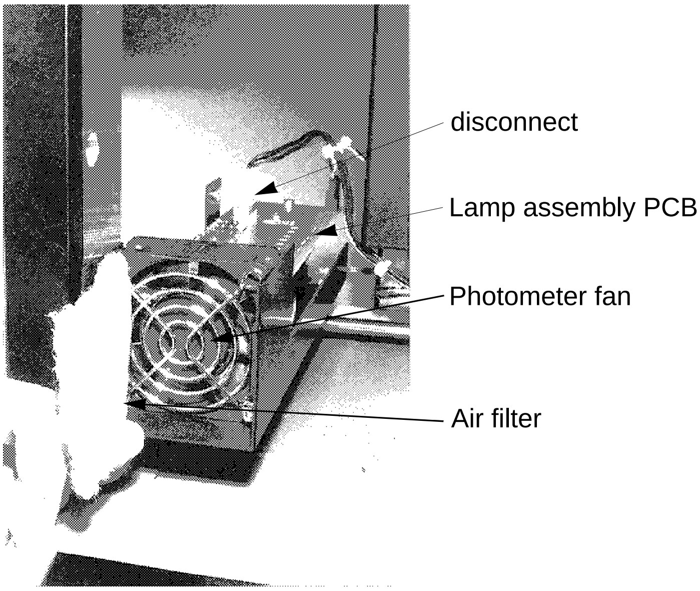
5.3.4.5 Photometer fan p/n 146 383

Remove *hood item 82* (see section 5.1.5).

Unscrew (1 screw) and lift off lamp cover, remove air filter.

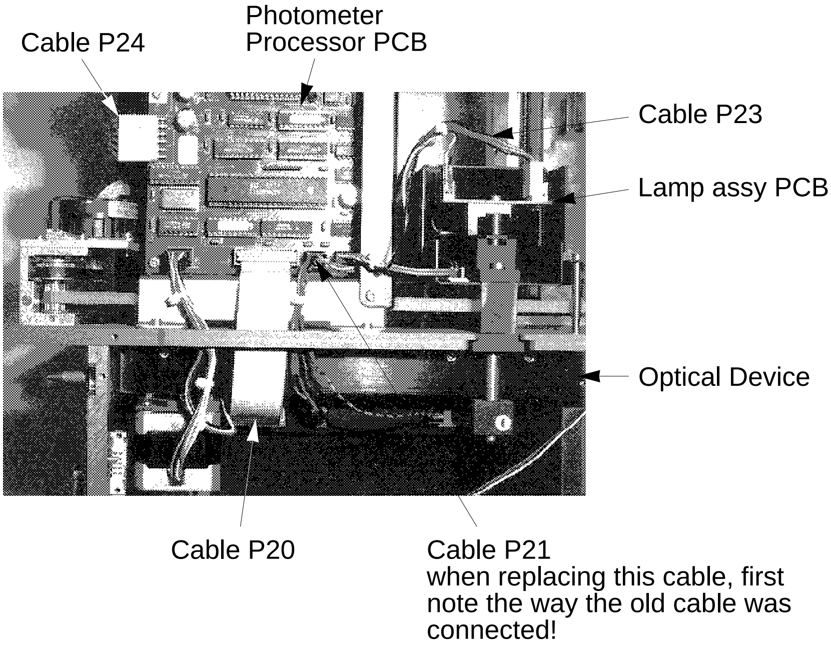
Disconnect fan cable on photometer processor PCB and lamp assy PCB, free cable from cable clamps and tie wraps (remove lamp assy PCB if necessary, see section 5.3.4.4).

Unscrew fan and replace.


disconnect
Lamp assembly PCB
Photometer fan
Air filter

5.3.4.6 Cables P20 p/n 146 378, P21 p/n 146 379, P23 p/n 146 381 and P24 p/n 146 382

See also Wiring Diagram 604 489.


Cable P24
Photometer Processor PCB
Cable P23
Lamp assy PCB
Optical Device
Cable P20
Cable P21

when replacing this cable, first note the way the old cable was connected!

ATTENTION
Make sure that connectors are properly placed on headers on PCB, i.e. all pins must be in their appropriate socket!

5.3.4.7 Optical device p/n 147 261

ATTENTION
Before removing optical device, remove photometer filter case. See section 1.1.5.1.1 Removing the Photometer Filter Case.

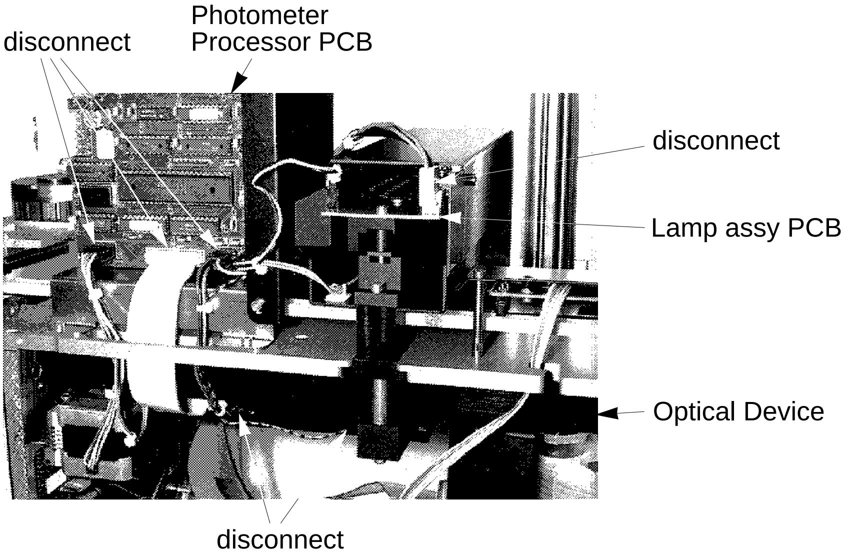
Remove *hood item 82*, *side cover left item 83* and *side cover right rear item 84* (see section 5.1.5).

Open reagent drawer, push plate transport all the way to the back of the module.

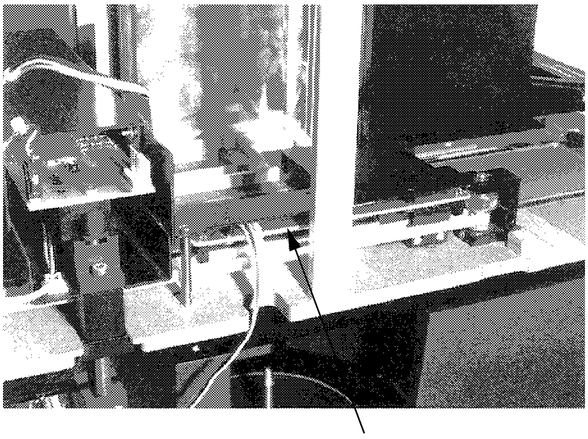
Disconnect step motor cable, cable P20 and photometer fan cable on photometer processor PCB.

Disconnect cable P23 on lamp assembly PCB.

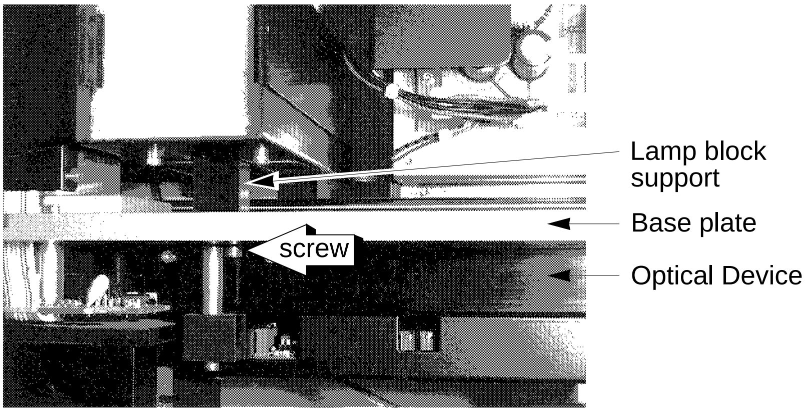
Disconnect the two connectors of cable P21 on optical device.


disconnect
Photometer Processor PCB
disconnect
Lamp assy PCB
Optical Device
disconnect

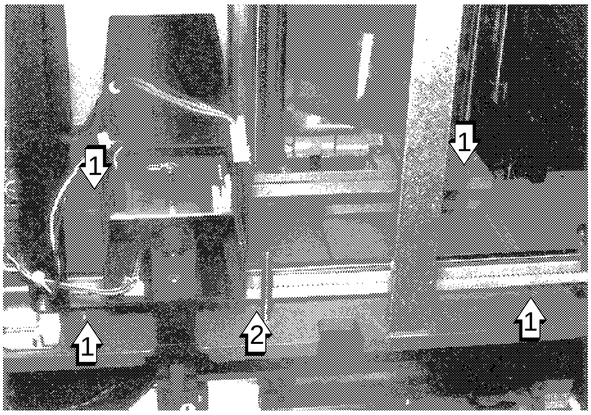
Unscrew connector board W8 compl. to gain access to the optical device fixing screws.


Connector Board W8 compl.

Unscrew lamp block support (1 screw) and place it on the milled surface of the base plate.


Lamp block support
Base plate
screw
Optical Device

Unscrew the optical device: first the four corner screws (1), then support the optical device from underneath (weight 3.3 kg / 7.3 lbs) and unfasten the fifth screw (2). Lower optical device approx. 5 mm / $^1/_4$ inch to clear positioning pins and lift it out of the module.

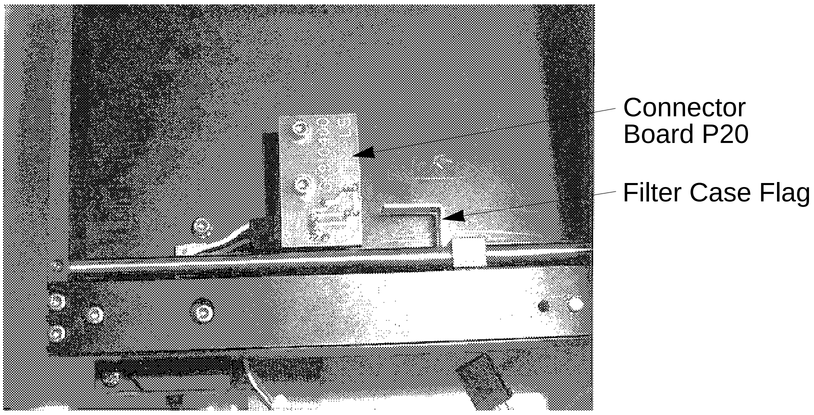


5.3.4.8 Connector board P20 p/n 146 244

Remove optical device from end module (see section 5.3.4.7).

Disconnect, unscrew and replace connector board P20.

When remounting, make sure filter case flag does not touch the sensor.



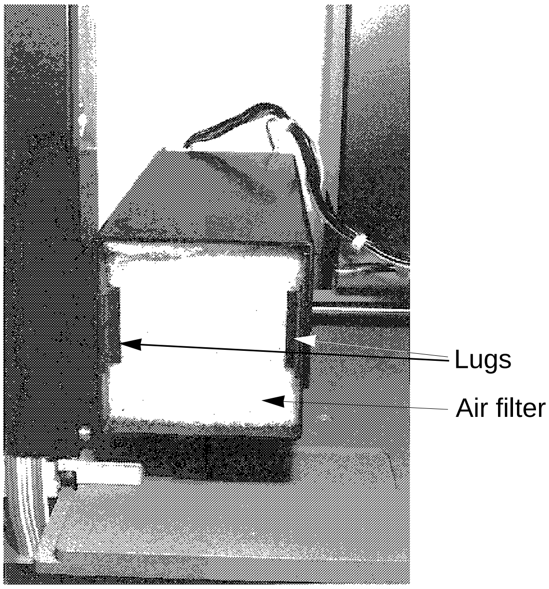
5.3.4.9 Photometer air filter p/n 147 963

Remove the container stack (see section 1.1.5.3.1).

Remove access plate (4 screws) on side of hood.

Remove the old air filter.

Make sure the new air filter is correctly held in place by the two lugs.



5.3.4.10 Step motor p/n 146 380

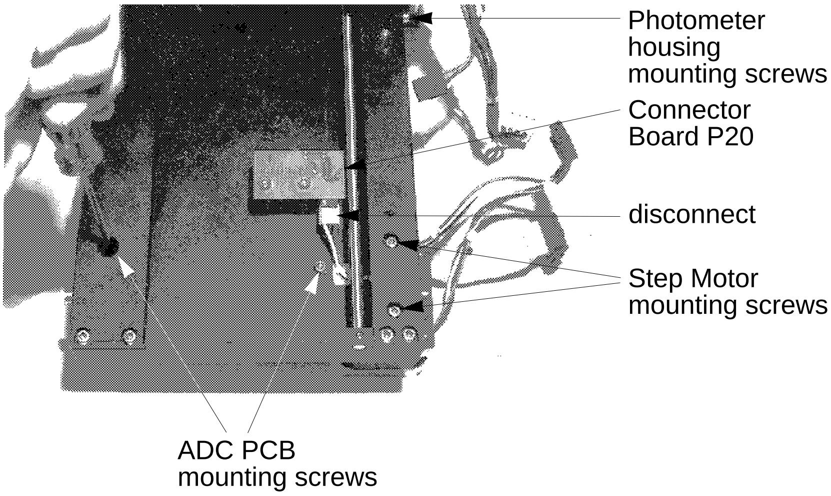
Remove filter case (refer to section 1.1.5.1.1).

Remove optical device from end module (see section 5.3.4.7).

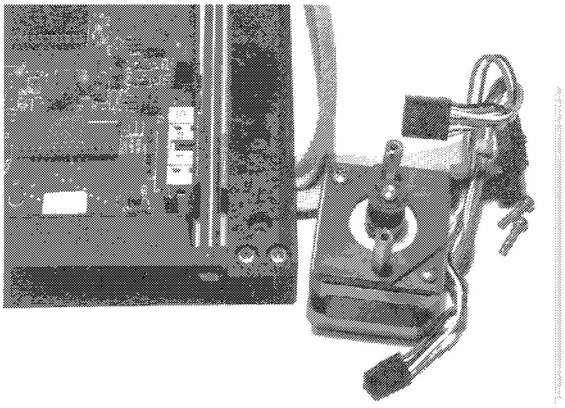
Remove the two screws fixing the A/D converter PCB.

Disconnect the cable on connector board P20, free cable from cable clamp.

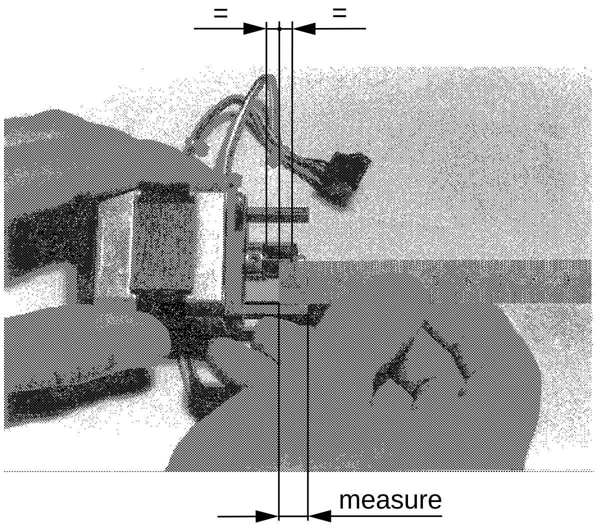
Unscrew (10 screws) and slide photometer housing out.


Photometer
housing
mounting screws
Connector
Board P20
disconnect
Step Motor
mounting screws
ADC PCB
mounting screws

Unscrew (2 screws) step motor compl. with motor flange and sprocket.



Measure the distance from the middle of the sprocket (center of belt) to the top of the spacer posts on motor flange.

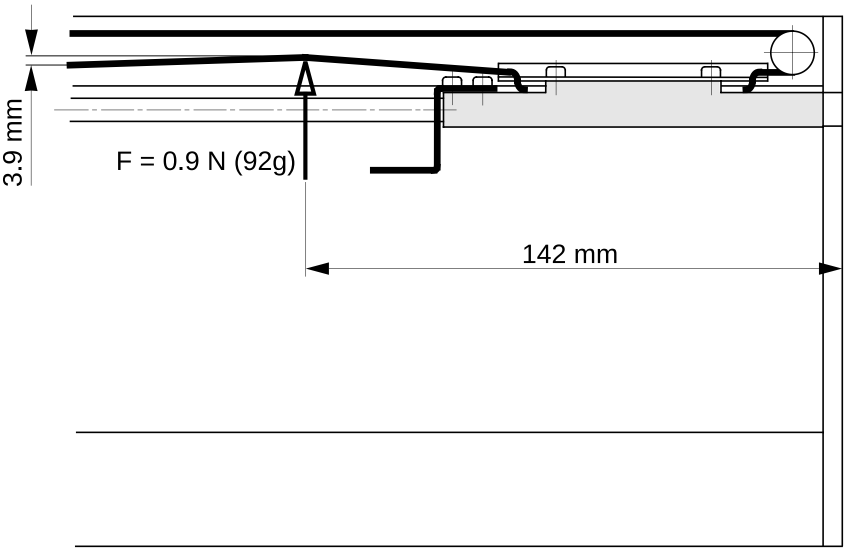


Remove motor flange and sprocket from old motor and mount on new one.

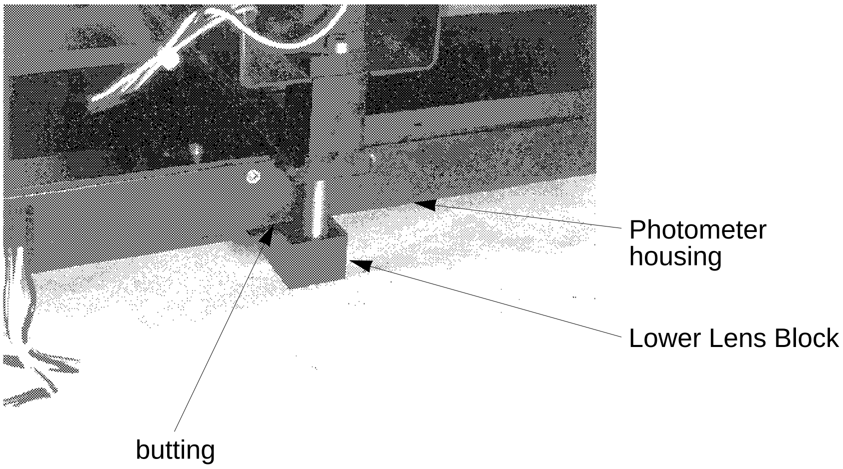
Remounting:

Remount step motor (use Loctite 222) and tighten belt (motor mounting holes are slotted).

Belt tension:



Now remount in reverse order. Make sure the photometer housing is butting against the lower lens block. Use Loctite 222 for the 10 photometer housing screws.


Photometer housing
Lower Lens Block
butting

5.3.4.11 Filter case belt p/n 258 050

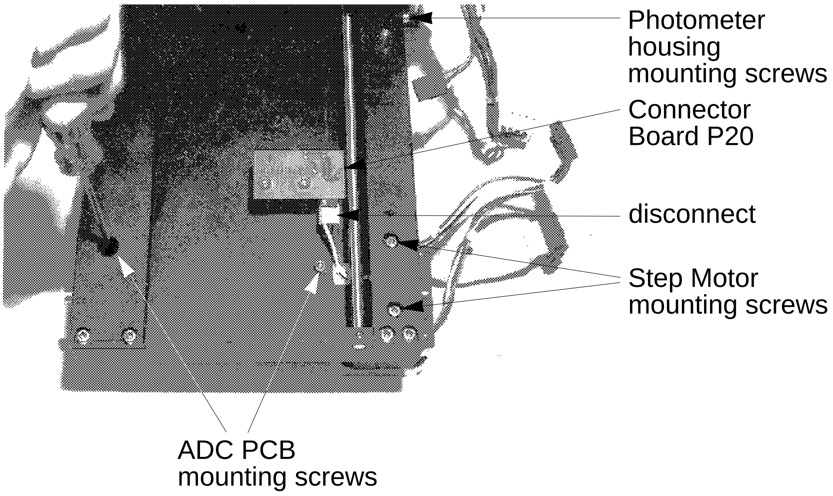
Remove filter case (refer to section 1.1.5.1.1).

Remove optical device from end module (see section 5.3.4.7).

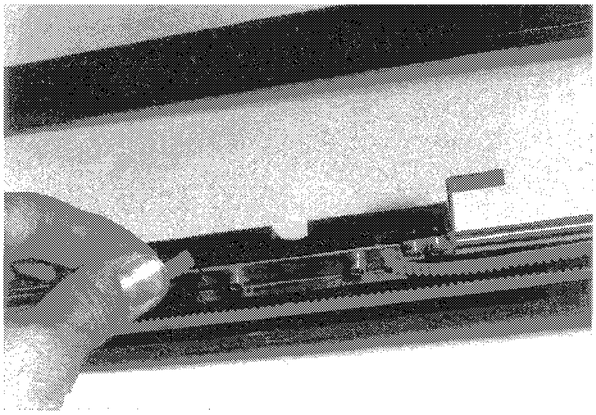
Remove the two screws fixing the A/D converter PCB.

Disconnect the cable on connector board P20, free cable from cable clamp.

Unscrew (10 screws) and slide photometer housing out.


Photometer housing mounting screws
Connector Board P20
disconnect
Step Motor mounting screws
ADC PCB mounting screws

Slacken belt by unfastening the two step motor fixing screws, then slip the belt off.



For remounting and belt tensioning refer to section 5.3.4.10, paragraph 'Remounting'.

5.3.4.12 A/D converter PCB p/n 146 384

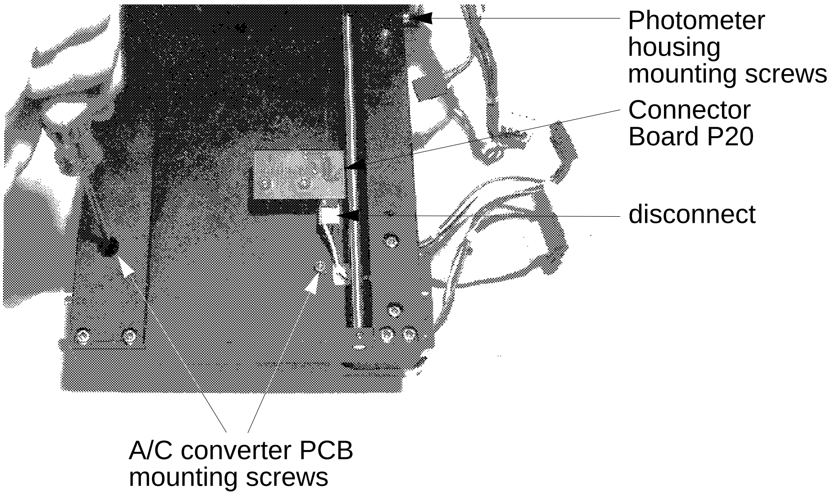
Remove filter case (refer to section 1.1.5.1.1).

Remove optical device from end module (see section 5.3.4.7).

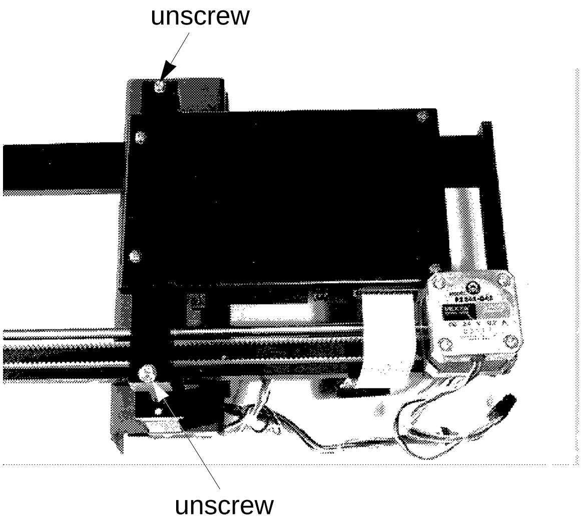
Remove the two screws fixing the A/D converter PCB.

Disconnect the cable on connector board P20, free cable from cable tie.

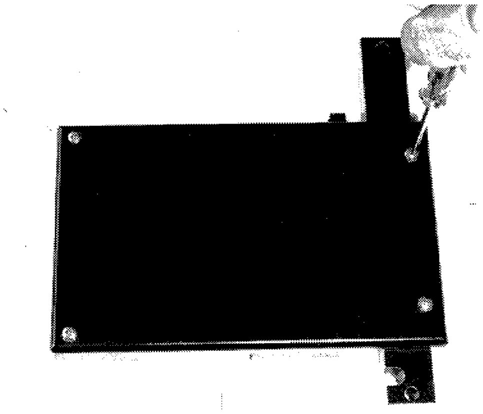
Unscrew (10 screws) and slide photometer housing out.


Photometer housing mounting screws
Connector Board P20
disconnect
A/C converter PCB mounting screws

Unscrew the A/D converter PCB (2 screws).


unscrew
unscrew

Now unscrew the housing from A/D converter PCB (4 screws) and replace the latter.



Remounting:

Remount in reverse order.

Make sure the photometer housing is butting against the lower lens block.

Apply a small amount of Loctite 222 to the two A/D converter PCB fixing screws and the ten photometer housing screws.

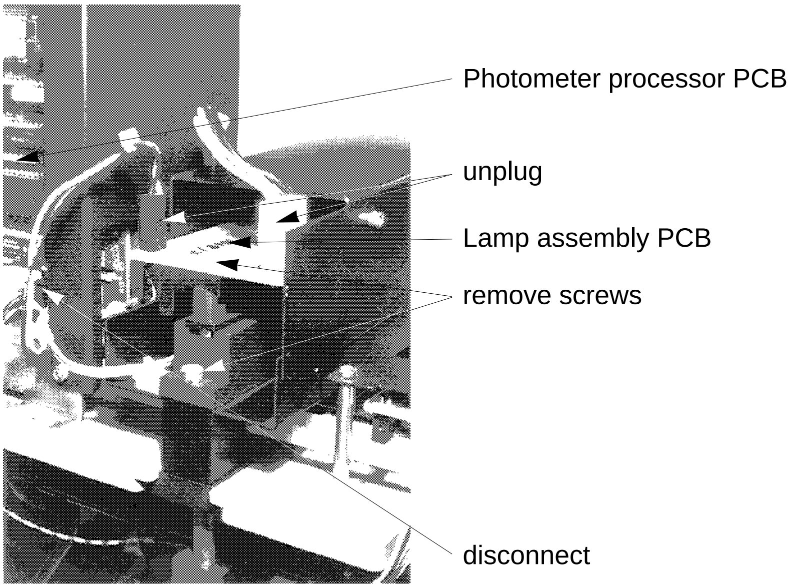
5.3.4.13 Protective glass p/n 147 964

Remove *hood item 82* and *side cover right rear item 84* (see section 5.1.5).

Unplug the two connectors from *lamp assy PCB*.

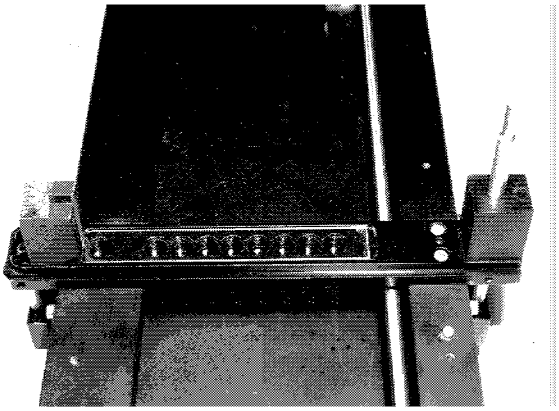
Remove screw fixing lamp assy PCB.

Disconnect ventilator cable from *photometer processor PCB*.


Photometer processor PCB
unplug
Lamp assembly PCB
remove screws
disconnect

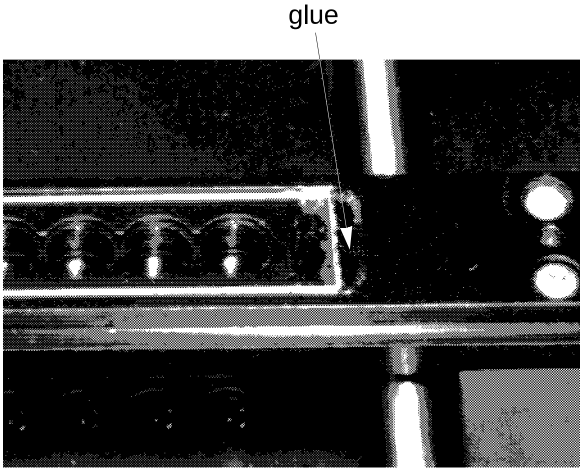
Unscrew upper lens block (2 screws M4x40, on the left from above, on the right from underneath).

Then lift the whole upper lens block unit compl. with housing carefully off of the module.



Now remove the old protective glass (use vacuum cleaner when braking off pieces). Remove all traces of glue from contacting surfaces.

Use common cyanoacrylate (e.g. Super Glue) to cement the new protective glass.



5.3.5 Spare Parts List

PHOTOMETER; extract from parts list 146999 Revision: 06

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
146378	CABLE P20	00		0.000	C
146379	CABLE P21	00		0.000	C
146380	STEP MOTOR P SM60	00		0.000	B
146381	CABLE P23	00		0.000	C
146382	CABLE P24	00		0.000	C
146383	PHOTOMETER FAN FA60	00		0.000	B
147256	FILTER CASE	00		0.000	Z
147257	LAMP COVER	00		0.000	C
147259	LAMPBLOCK-SUPPORT	00		0.000	C
147261	OPTICAL DEVICE	01		0.000	C
147964	PROTECTION GLAS	00		0.000	C
235524	FILTERSTRIP	00		0.000	Z
258050	FILTER CASE BELT T2.5 420Z	00		0.000	C
147260	VERIFICATION PLATE	03		0.000	Z

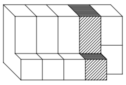
5.3.6 Photometer Filter Order List:

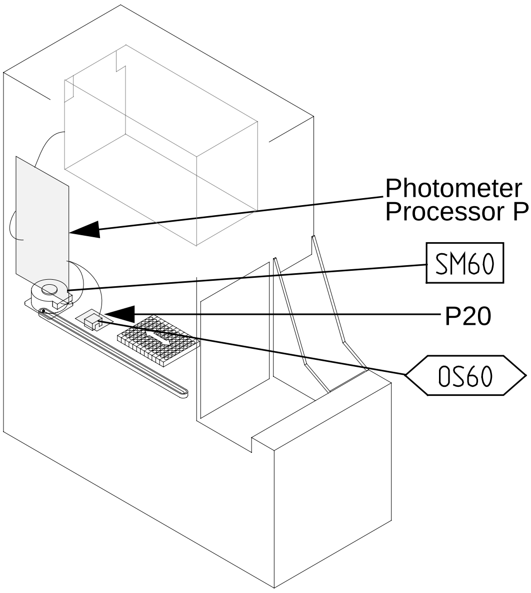
P/N	DESCRIPTION
OPTIONAL PHOTOMETER FILTERS	
235 512	370 nm
235 513	380 nm
235 514	414 nm
235 507	540 nm
235 520	510 nm
235 508	550 nm
235 521	570 nm
235 522	600 nm
235 525	610 nm
235 523	650 nm
235 510	690 nm
upon request	750 nm

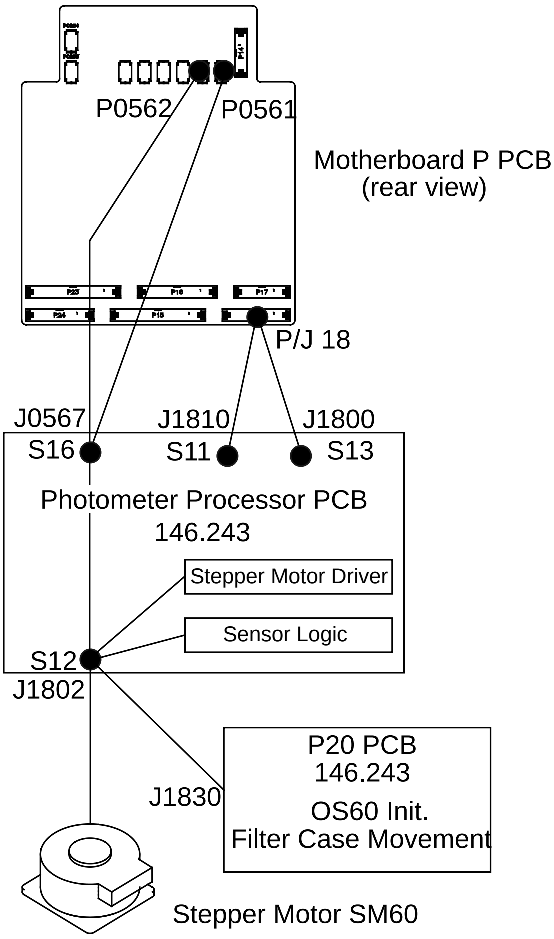
P/N	DESCRIPTION
STANDARD PHOTOMETER FILTERS	
235 511	340 nm
235 504	405 nm
235 505	450 nm
235 506	492 nm
235 509	620 nm

5.3.7 Troubleshooting

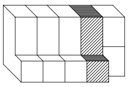
Module:	End
Assembly:	Photometer
Sensor:	Optical Switch OS60 Filter Case Drive
Boards:	P20, Photometer Processor PCB Motherboard P
Error Message:	

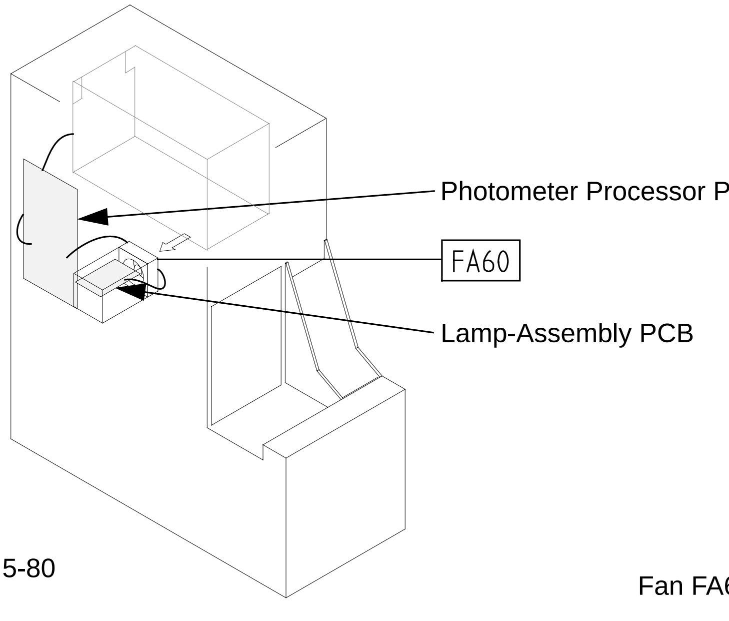


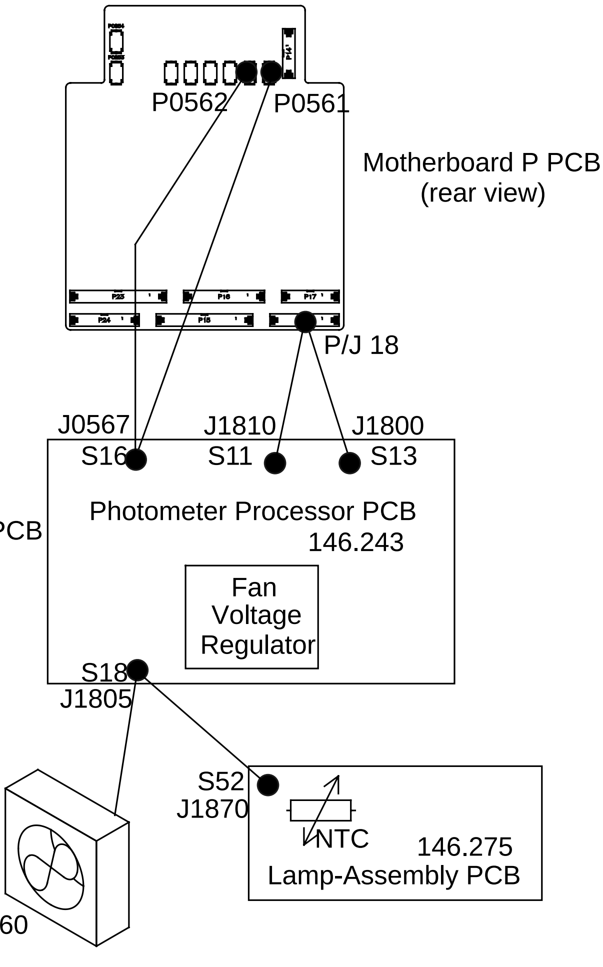

Photometer Processor PCB
SM60
P20
OS60


P0562
P0561
Motherboard P PCB (rear view)
P/J 18
J0567
S16
J1810
S11
J1800
S13
Photometer Processor PCB
146.243
Stepper Motor Driver
Sensor Logic
S12
J1802
P20 PCB
146.243
OS60 Init.
Filter Case Movement
J1830
Stepper Motor SM60

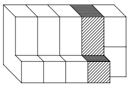
Module:	End
Assembly:	Photometer
Actor:	Fan FA60, Lamp Assembly Cooling
Boards:	Photometer Processor PCB Lamp-Assembly PCB, Motherboard P
Error Message:	

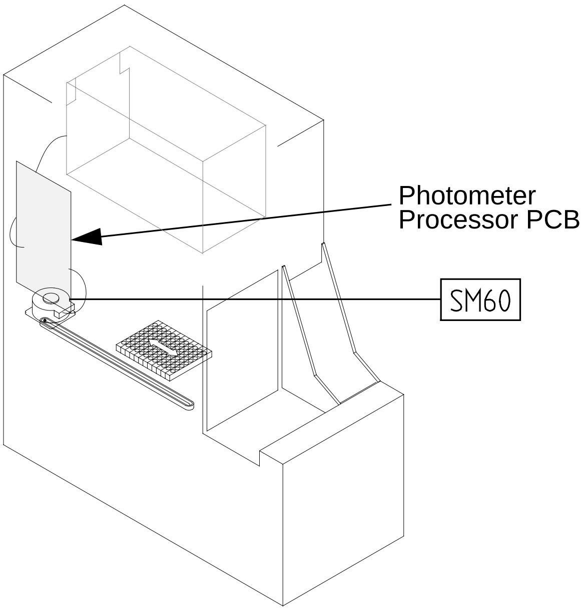


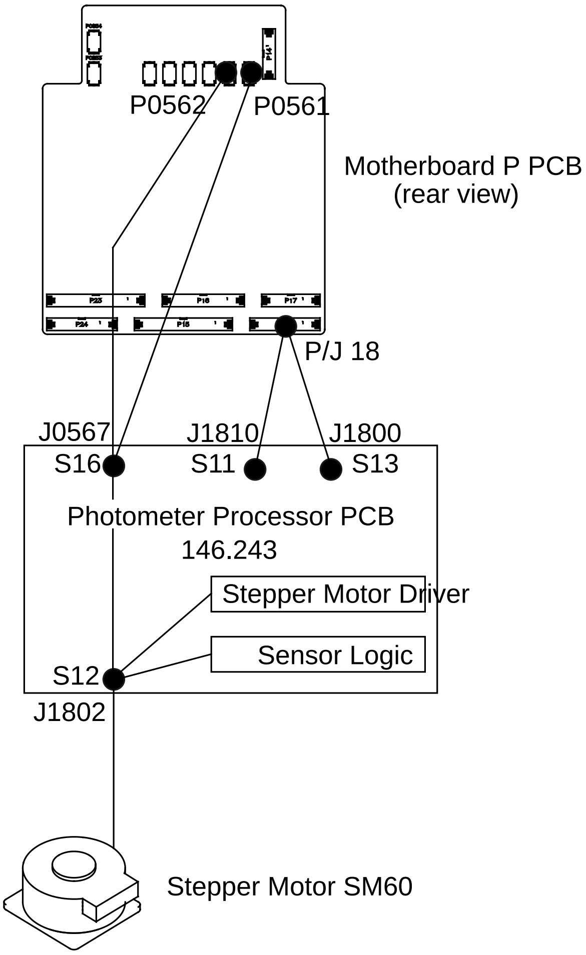

Photometer Processor PCB
FA60
Lamp-Assembly PCB


P0562
P0561
Motherboard P PCB (rear view)
P/J 18
J0567
S16
J1810
S11
J1800
S13
Photometer Processor PCB
146.243
Fan Voltage Regulator
S18
J1805
S52
J1870
NTC
146.275
Lamp-Assembly PCB
Fan FA60

Module:	End
Assembly:	Photometer
Actor:	Stepper Motor SM60 Filter Case Movement
Boards:	Photometer Processor PCB Motherboard P
Error Message:	




Photometer
Processor PCB
SM60


P0562
P0561
Motherboard P PCB
(rear view)
P25
P16
P17
P24
P15
P/J 18
J0567
S16
J1810
S11
J1800
S13
Photometer Processor PCB
146.243
Stepper Motor Driver
Sensor Logic
S12
J1802
Stepper Motor SM60

Exit Stack

147 740

Functional Description

Connector Boards

P2	146 259
P3	146 261
P4	146 263
P5	146 265
P6	146 266
P9	146 268

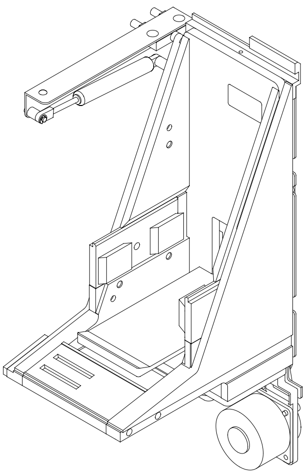
Wiring Diagram

Replacing Spare Parts

Spare Parts List

3D Drawing

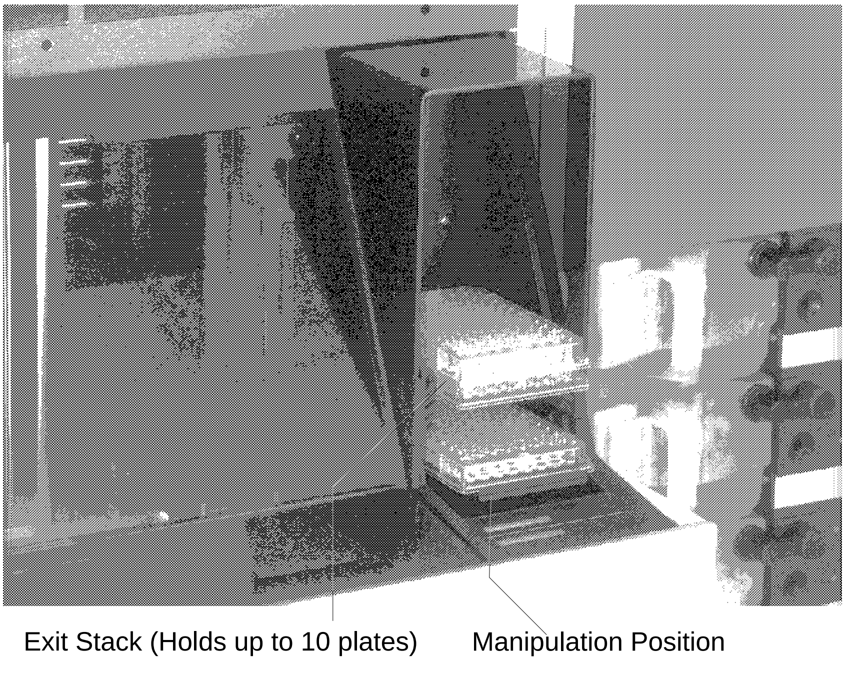
Troubleshooting



5.4 Exit Stack 147 740

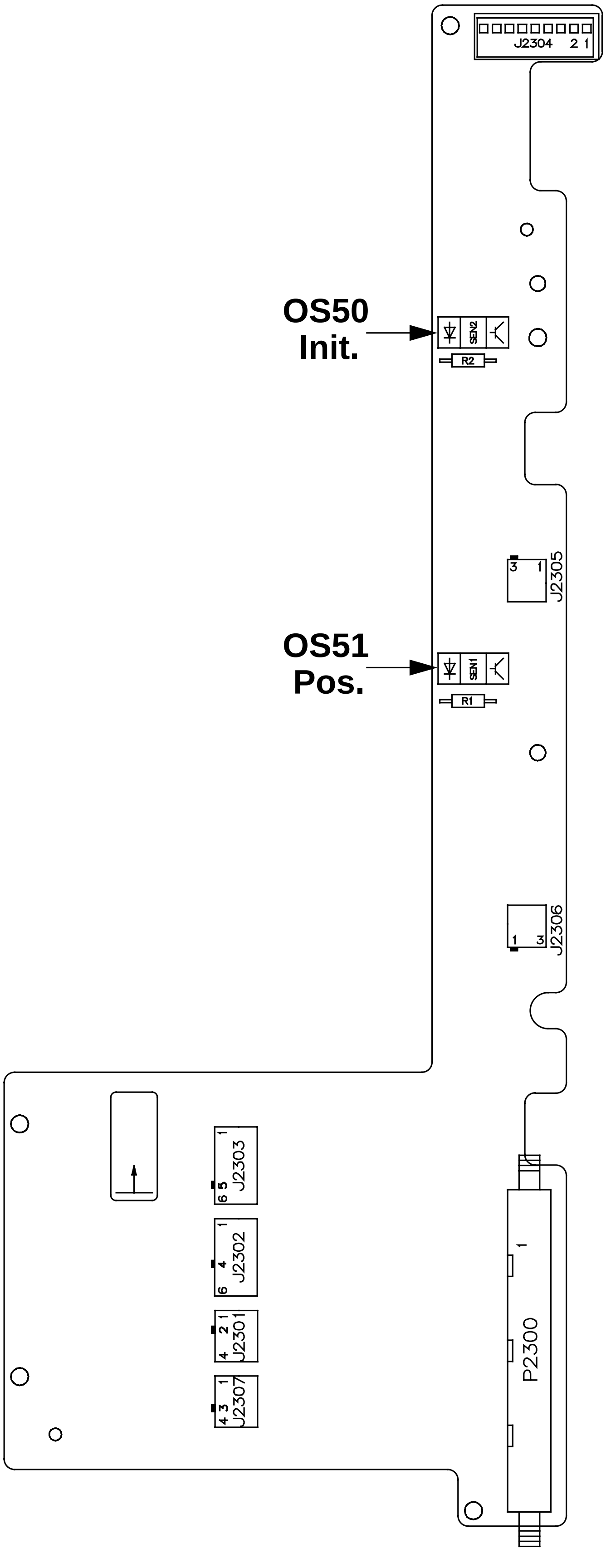
5.4.1 Functional Description

The exit stack stores up to 10 processed plates. Plates may be removed from the manipulation position at any time without interrupting processing. Removed plates are either additionally processed or diposed off. A sensor controls the exit status. If the stack is full, a warning message is generated by the user software. After external processing, the plate may be reloaded into the instrument via the entry stack or entry platform.



5.4.2 Connector Boards

Connector Board P2 PCB Component Layout 146.259 revision 00

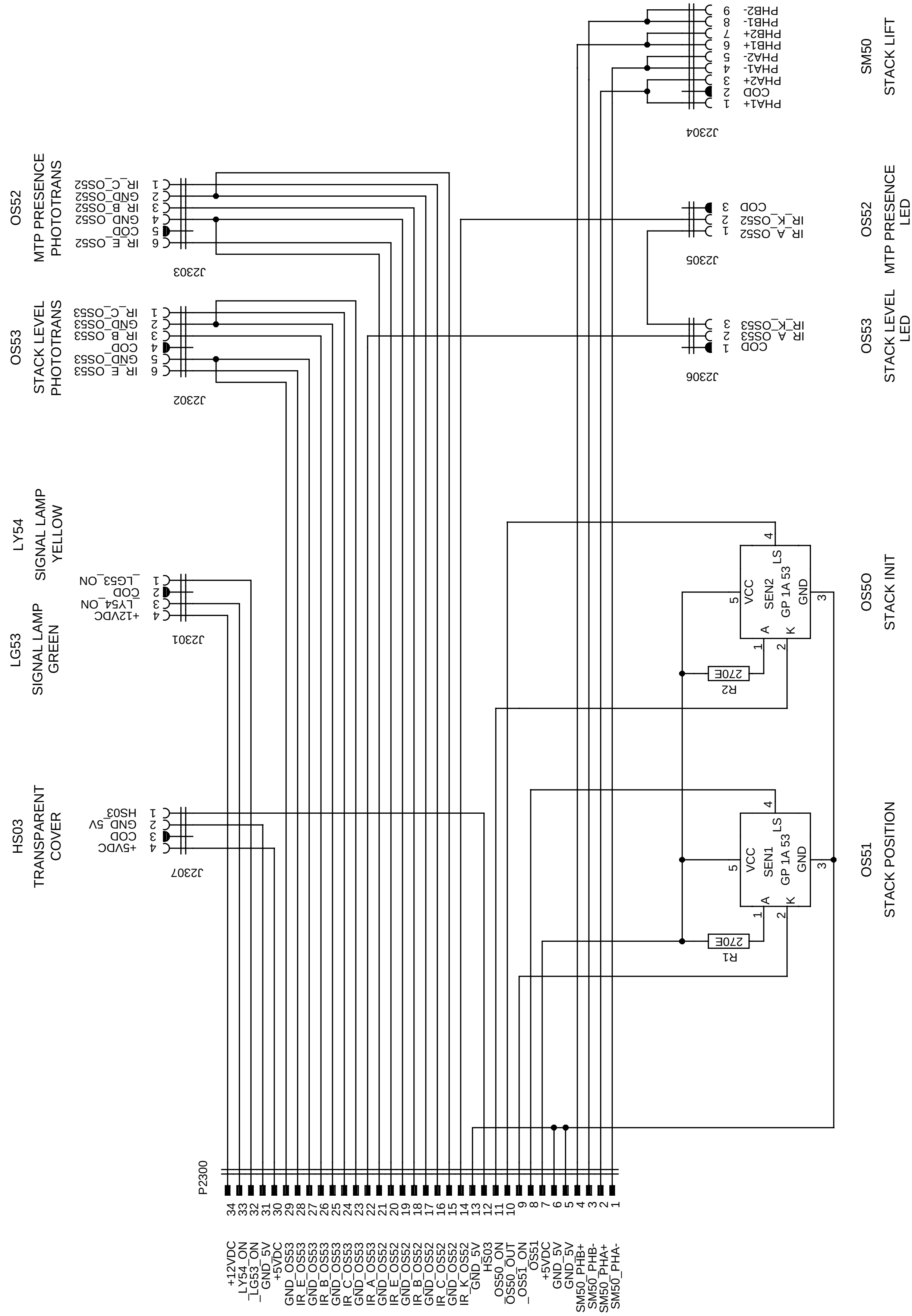

J2304
2 1
OS50
Init.
SEN2
R2
3 1
J2305
OS51
Pos.
SEN1
R1
J2306
1 3
J2303
1
6 5
J2302
1
6 4
J2301
4 2 1
J2307
4 3 1
P2300
1

]

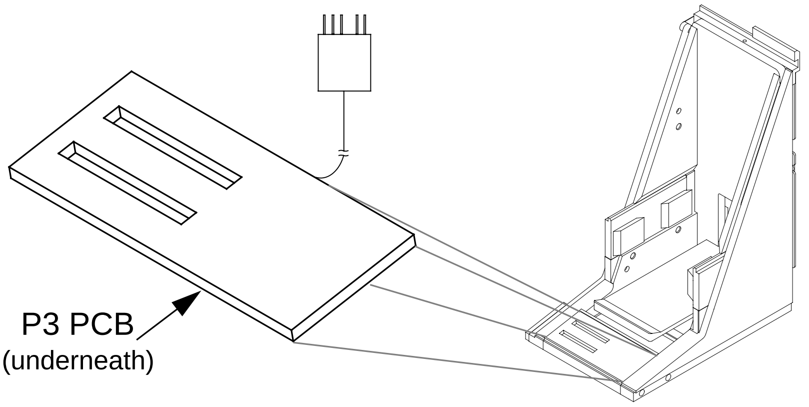
Connector Board P2 PCB

Main Connector Board Exit Stack Lift

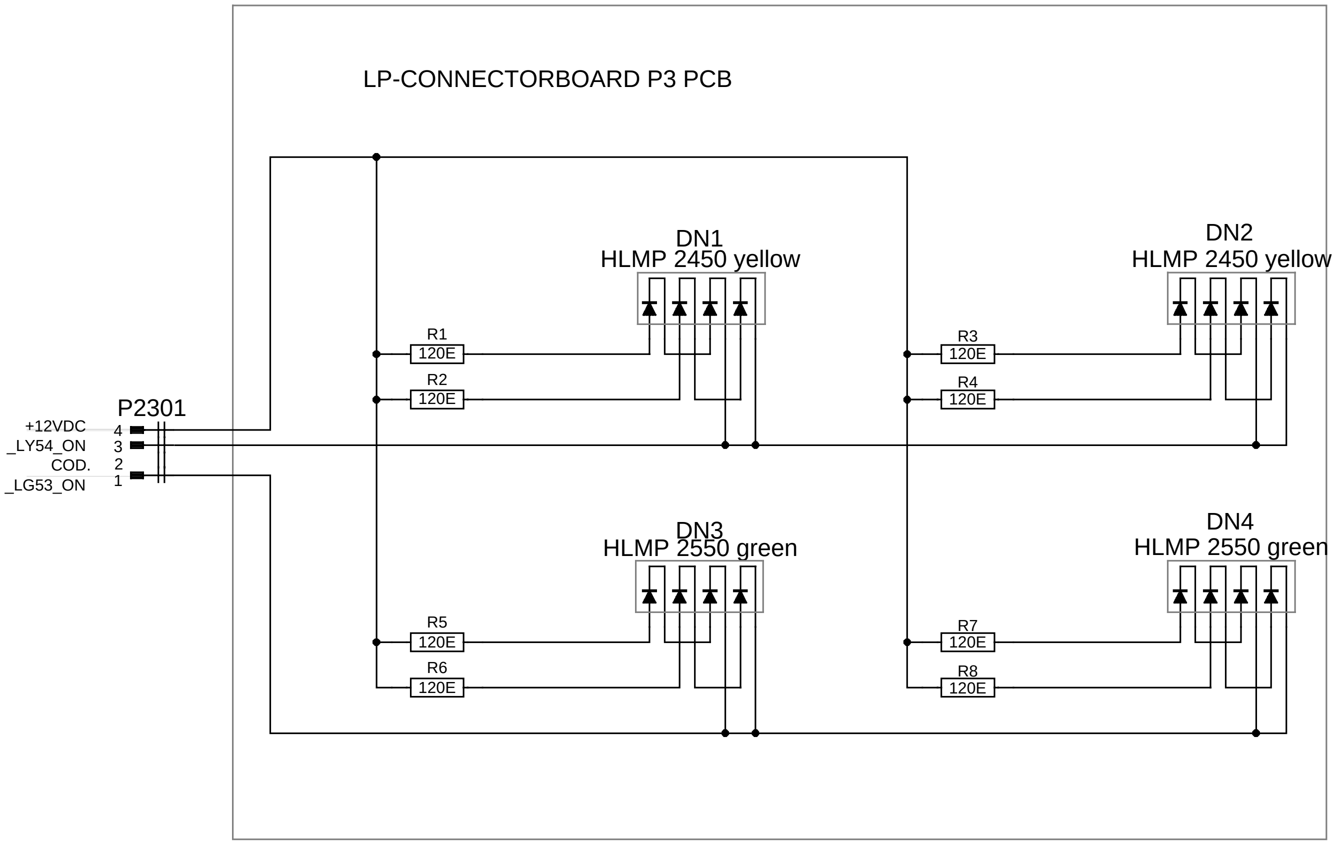
604.832 revision 00


SM50
STACK LIFT
J2304
1 PHA1+
2 COD
3 PHA2+
4 PHA1-
5 PHA2-
6 PHB1+
7 PHB2+
8 PHB1-
9 PHB2-
OS52
MTP PRESENCE
PHOTOTRANS
J2303
1 IR_C_OS52
2 GND_OS52
3 IR_B_OS52
4 GND_OS52
5 COD
6 IR_E_OS52
OS52
MTP PRESENCE
LED
J2305
1 IR_A_OS52
2 IR_K_OS52
3 COD
OS53
STACK LEVEL
PHOTOTRANS
J2302
1 IR_C_OS53
2 GND_OS53
3 IR_B_OS53
4 COD
5 GND_OS53
6 IR_E_OS53
OS53
STACK LEVEL
LED
J2306
1 COD
2 IR_A_OS53
3 IR_K_OS53
LY54
SIGNAL LAMP
YELLOW
LG53
SIGNAL LAMP
GREEN
J2301
1 _LG53_ON
2 COD
3 _LY54_ON
4 +12VDC
OS50
STACK INIT
VCC
SEN2
GP 1A 53
GND
LS
A
K
1
2
3
4
5
R2
270E
HS03
TRANSPARENT
COVER
J2307
1 HS03
2 GND_5V
3 COD
4 +5VDC
OS51
STACK POSITION
VCC
SEN1
GP 1A 53
GND
LS
A
K
1
2
3
4
5
R1
270E
P2300
34 +12VDC
33 _LY54_ON
32 _LG53_ON
31 GND_5V
30 +5VDC
29 GND_OS53
28 IR_E_OS53
27 GND_OS53
26 IR_B_OS53
25 GND_OS53
24 IR_C_OS53
23 GND_OS53
22 IR_A_OS53
21 GND_OS52
20 IR_E_OS52
19 GND_OS52
18 IR_B_OS52
17 GND_OS52
16 IR_C_OS52
15 GND_OS52
14 IR_K_OS52
13 GND_5V
12 HS03
11 _OS50_ON
10 OS50_OUT
9 _OS51_ON
8 OS51
7 +5VDC
6 GND_5V
5 GND_5V
4 SM50_PHB+
3 SM50_PHB-
2 SM50_PHA+
1 SM50_PHA-

Connector Board P3 PCB

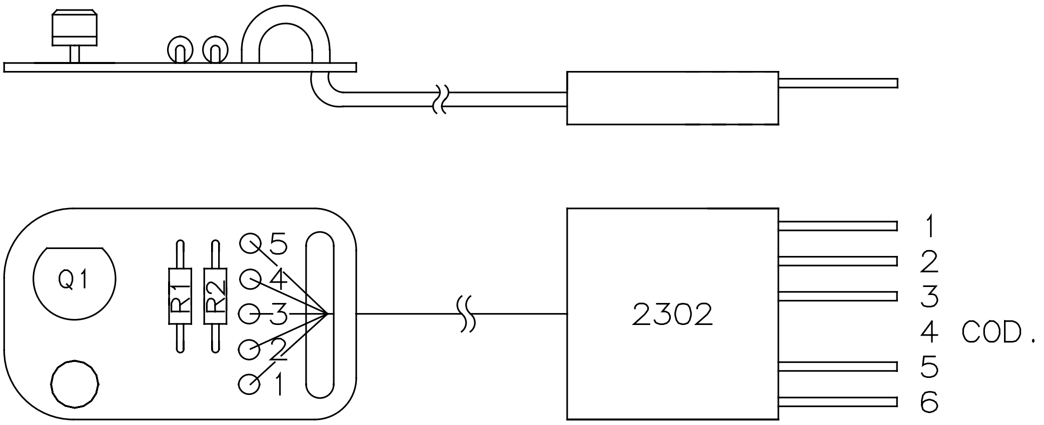

P3 PCB
(underneath)

Connector Board P3 PCB Light Panel Exit Stack 604.833 revision 99


LP-CONNECTORBOARD P3 PCB
DN1
HLMP 2450 yellow
DN2
HLMP 2450 yellow
DN3
HLMP 2550 green
DN4
HLMP 2550 green
R1
120E
R2
120E
R3
120E
R4
120E
R5
120E
R6
120E
R7
120E
R8
120E
P2301
+12VDC 4
_LY54_ON 3
COD. 2
_LG53_ON 1

Connector Board P4 PCB

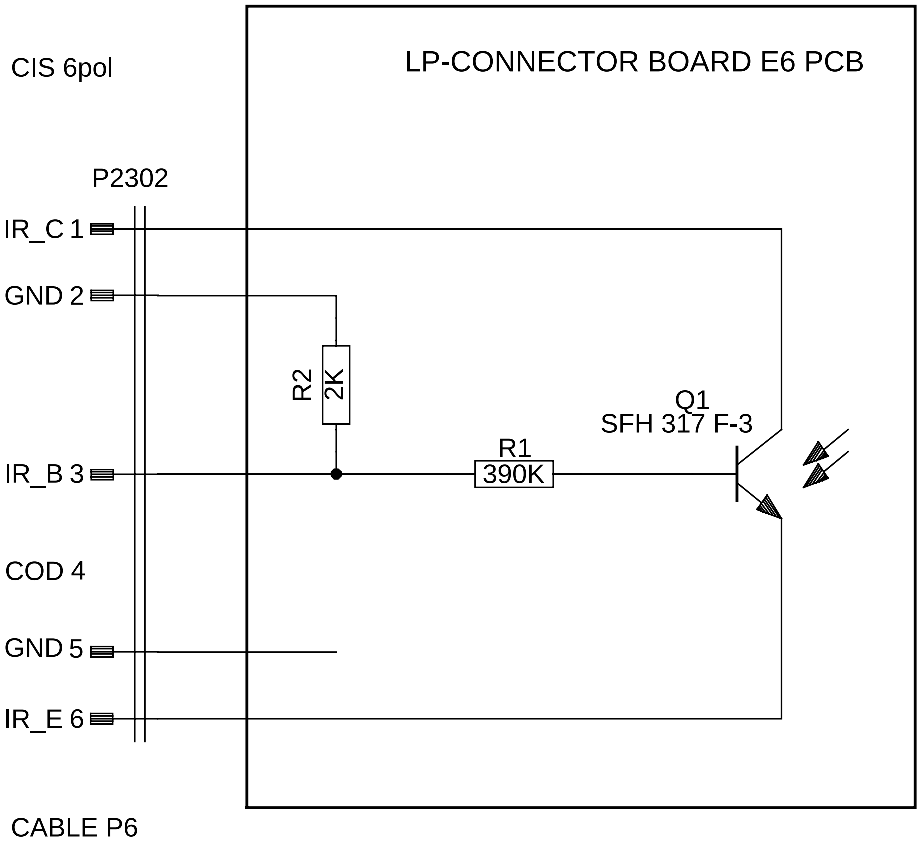
Component Layout 146.263 revision 00


Q1
R1
R2
5
4
3
2
1
2302
1
2
3
4 COD.
5
6

Pin	Print
1	1
2	2
3	3
4	–
5	4
6	5

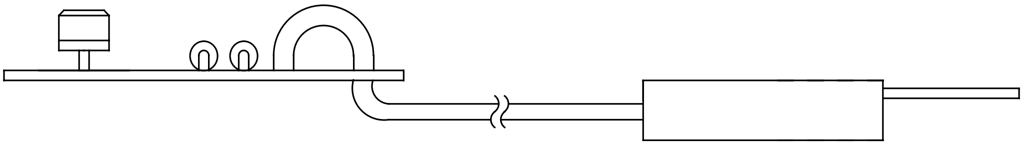
Connector Board P4 PCB

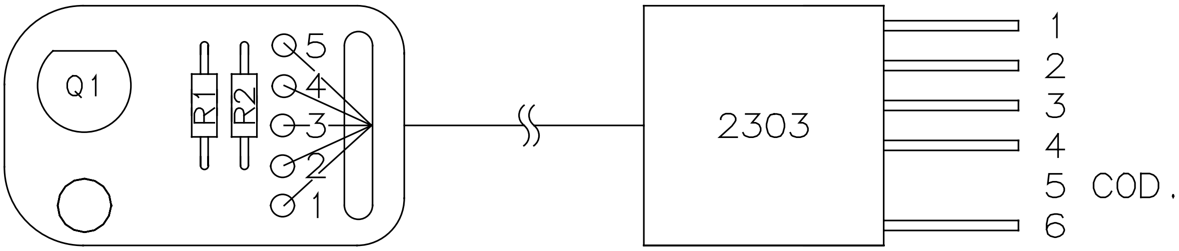
Photo Transistor Stack Level OS53 604.834 revision 00


CIS 6pol
LP-CONNECTOR BOARD E6 PCB
P2302
IR_C 1
GND 2
R2
2K
Q1
SFH 317 F-3
R1
390K
IR_B 3
COD 4
GND 5
IR_E 6
CABLE P6

Connector Board P5 PCB

Component Layout 146.265 revision 00

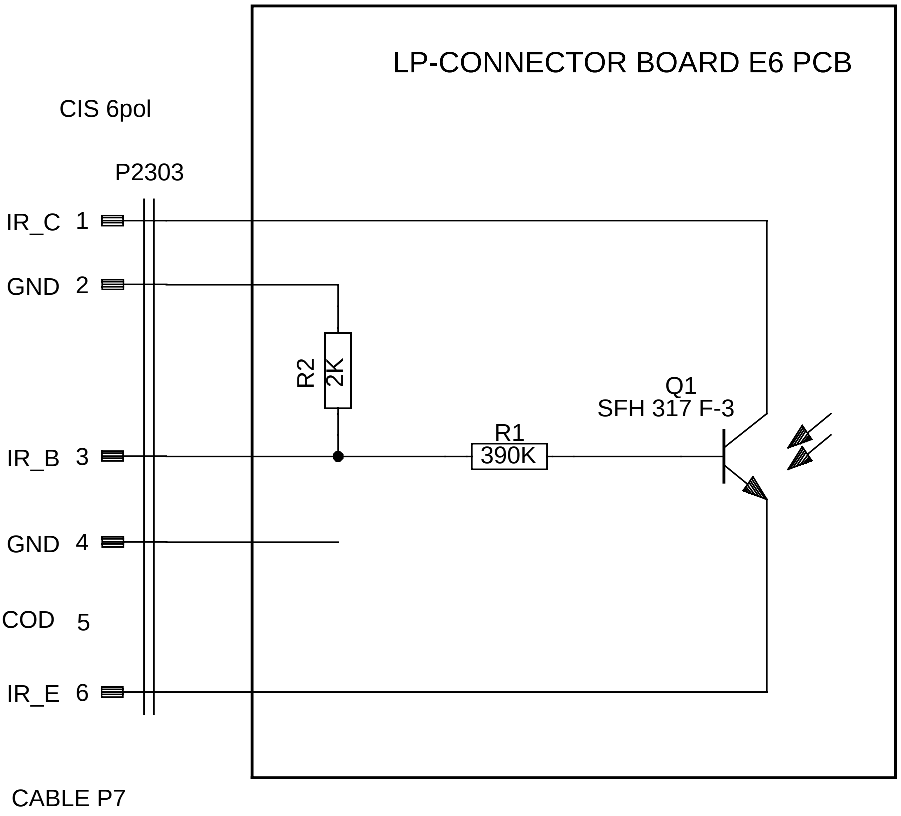



Q1
R1
R2
5
4
3
2
1
2303
1
2
3
4
5 COD.
6

Pin	Print
1	1
2	2
3	3
4	4
5	–
6	5

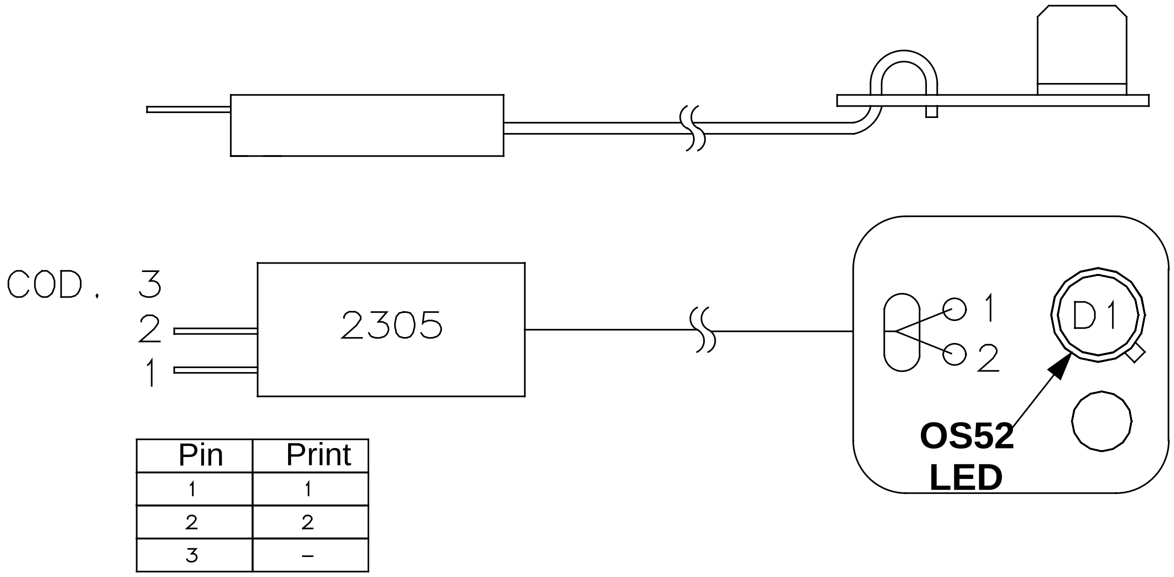
Connector Board P5 PCB

Photo Transistor MTP-Detector OS52
604.835 revision 00


LP-CONNECTOR BOARD E6 PCB
CIS 6pol
P2303
IR_C 1
GND 2
IR_B 3
GND 4
COD 5
IR_E 6
R2
2K
R1
390K
Q1
SFH 317 F-3
CABLE P7

Connector Board P6 PCB

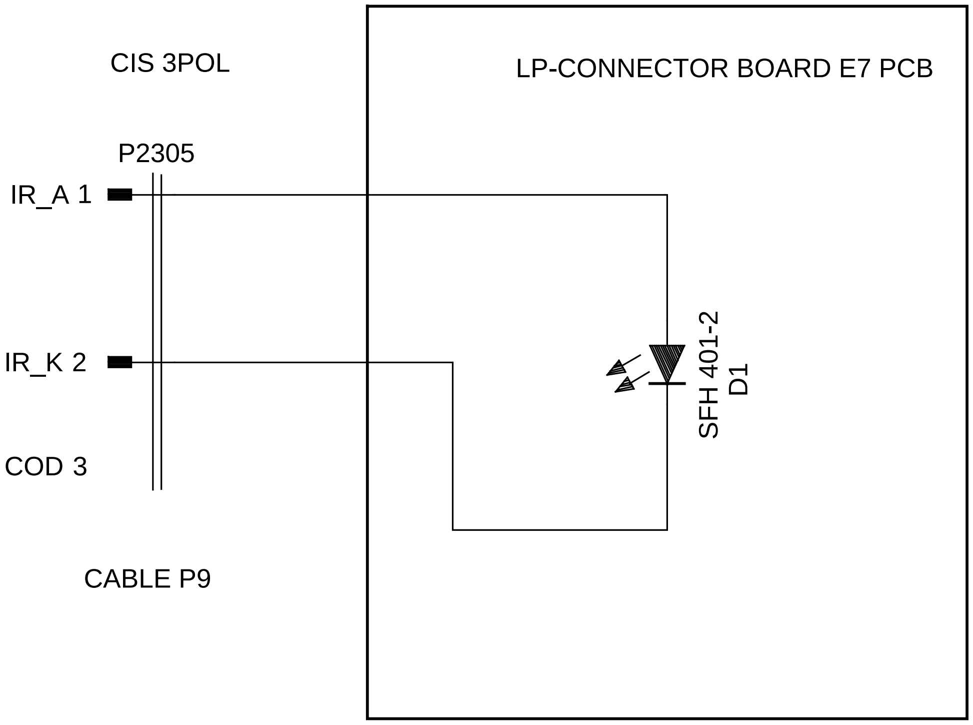
Component Layout 146.266 revision 00


COD. 3
2
1
2305
1
2
D1
OS52
LED

Pin	Print
1	1
2	2
3	–

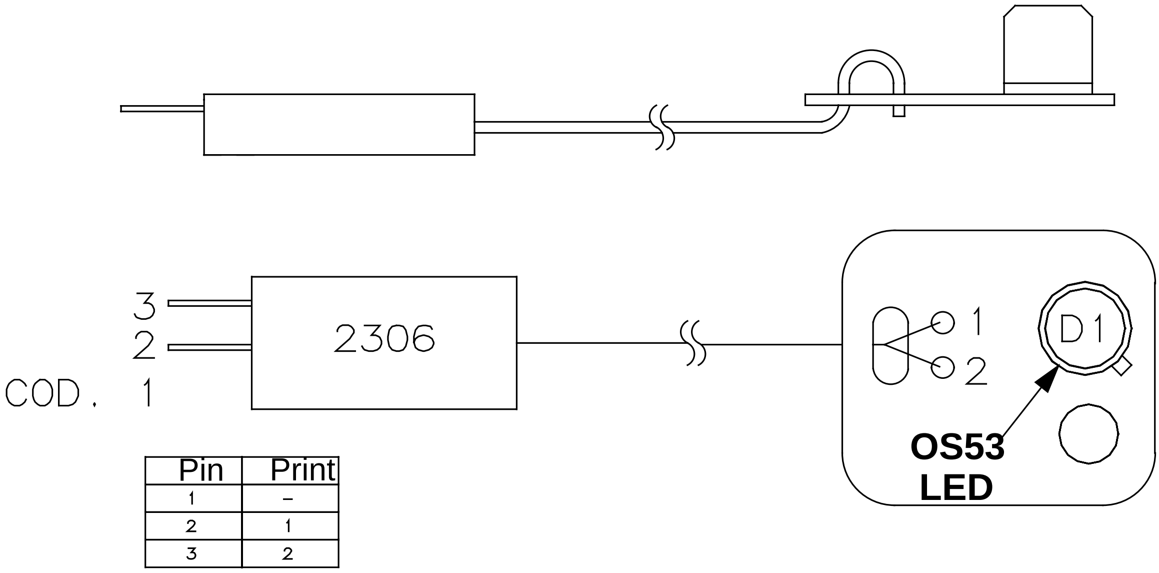
Connector Board P6 PCB

LED MTP Presence OS52
604.836 revision 00


CIS 3POL
LP-CONNECTOR BOARD E7 PCB
P2305
IR_A 1
IR_K 2
COD 3
SFH 401-2
D1
CABLE P9

Connector Board P9 PCB

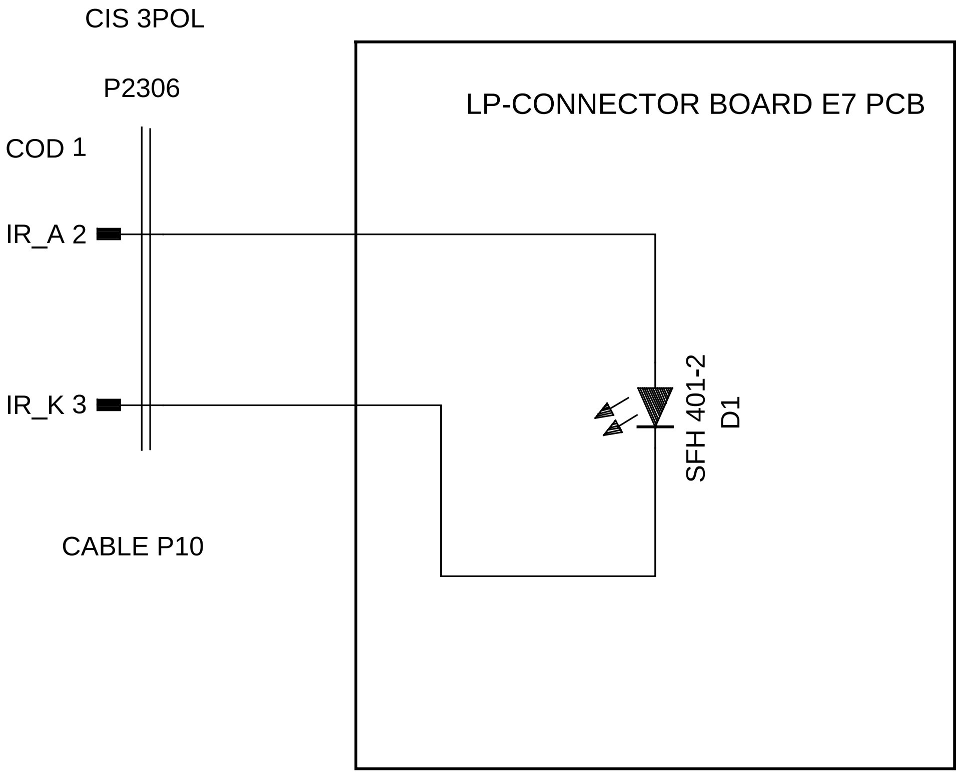
Component Layout 146.268 revision 00


3
2
COD. 1
2306
1
2
D1
OS53
LED

Pin	Print
1	–
2	1
3	2

Connector Board P9 PCB

LED Stack Level OS53
604.837 revision 00


CIS 3POL
P2306
COD 1
IR_A 2
IR_K 3
CABLE P10
LP-CONNECTOR BOARD E7 PCB
SFH 401-2
D1

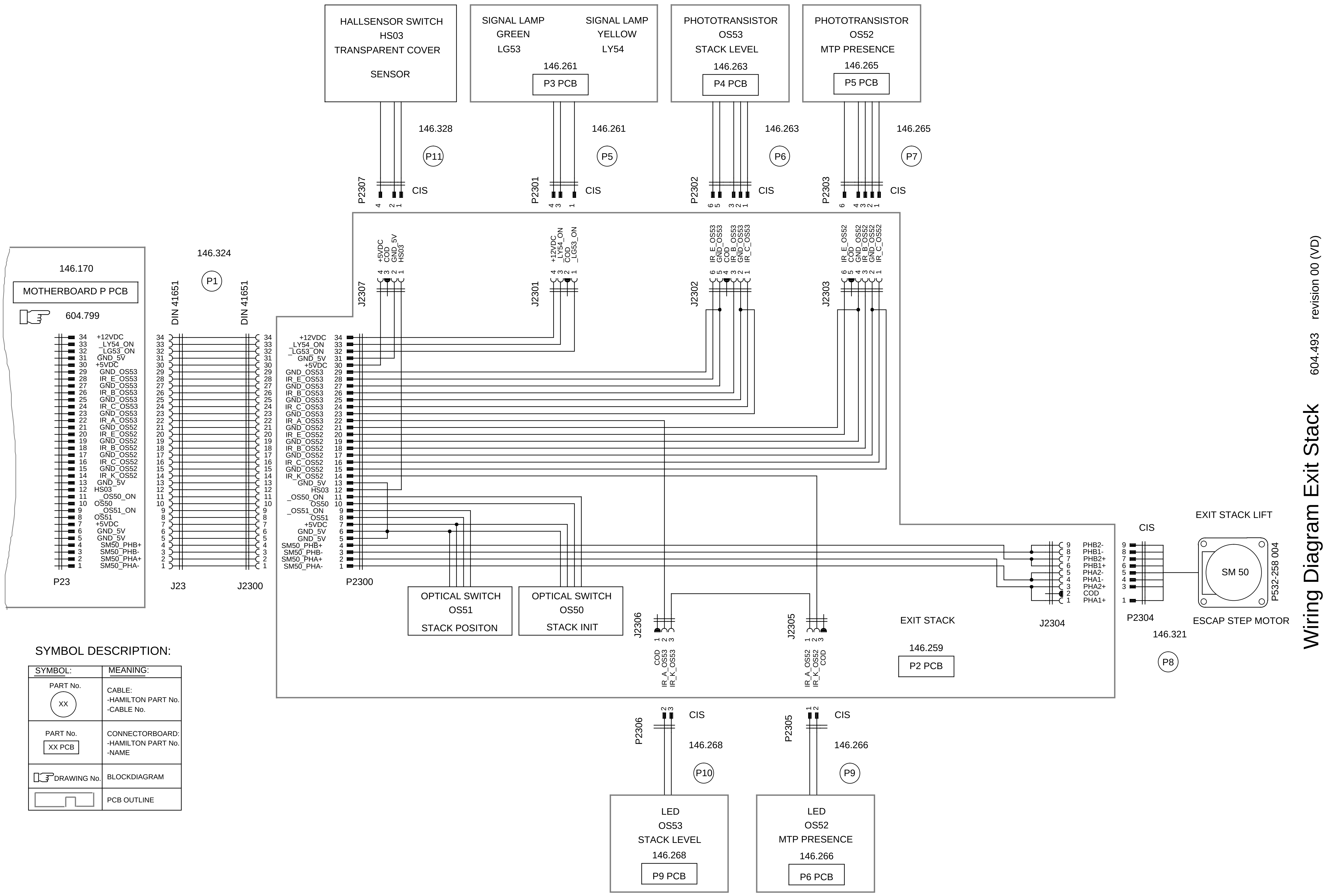
5.4.3 Wiring Diagram

Refer to the drawing on the following page:

- ❒ Exit Stack Dwg No. 604 493

Wiring Diagram Exit Stack

604.493 revision 00 (VD)


HALLSENSOR SWITCH
HS03
TRANSPARENT COVER
SENSOR
SIGNAL LAMP
GREEN
LG53
SIGNAL LAMP
YELLOW
LY54
146.261
P3 PCB
PHOTOTRANSISTOR
OS53
STACK LEVEL
146.263
P4 PCB
PHOTOTRANSISTOR
OS52
MTP PRESENCE
146.265
P5 PCB
146.328
P11
146.261
P5
146.263
P6
146.265
P7
P2307
P2301
P2302
P2303
CIS
J2307
+5VDC
COD
GND_5V
HS03
J2301
+12VDC
_LY54_ON
COD
_LG53_ON
J2302
IR_E_OS53
GND_OS53
COD
IR_B_OS53
GND_OS53
IR_C_OS53
J2303
IR_E_OS52
COD
GND_OS52
IR_B_OS52
GND_OS52
IR_C_OS52
146.170
MOTHERBOARD P PCB
604.799
146.324
P1
DIN 41651
34 +12VDC
33 _LY54_ON
32 _LG53_ON
31 GND_5V
30 +5VDC
29 GND_OS53
28 IR_E_OS53
27 GND_OS53
26 IR_B_OS53
25 GND_OS53
24 IR_C_OS53
23 GND_OS53
22 IR_A_OS53
21 GND_OS52
20 IR_E_OS52
19 GND_OS52
18 IR_B_OS52
17 GND_OS52
16 IR_C_OS52
15 GND_OS52
14 IR_K_OS52
13 GND_5V
12 HS03
11 _OS50_ON
10 OS50
9 _OS51_ON
8 OS51
7 +5VDC
6 GND_5V
5 GND_5V
4 SM50_PHB+
3 SM50_PHB-
2 SM50_PHA+
1 SM50_PHA-
P23
J23
J2300
P2300
OPTICAL SWITCH
OS51
STACK POSITON
OPTICAL SWITCH
OS50
STACK INIT
J2306
COD
IR_A_OS53
IR_K_OS53
J2305
IR_A_OS52
IR_K_OS52
COD
EXIT STACK
146.259
P2 PCB
J2304
PHB2-
PHB1-
PHB2+
PHB1+
PHA2-
PHA1-
PHA2+
COD
PHA1+
P2304
146.321
P8
EXIT STACK LIFT
SM 50
ESCAP STEP MOTOR
P532-258 004
P2306
146.268
P10
P2305
146.266
P9
LED
OS53
STACK LEVEL
146.268
P9 PCB
LED
OS52
MTP PRESENCE
146.266
P6 PCB

SYMBOL DESCRIPTION:

SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
☞ DRAWING No.	BLOCKDIAGRAM
⊓	PCB OUTLINE

5.4.4 Replacing Spare Parts

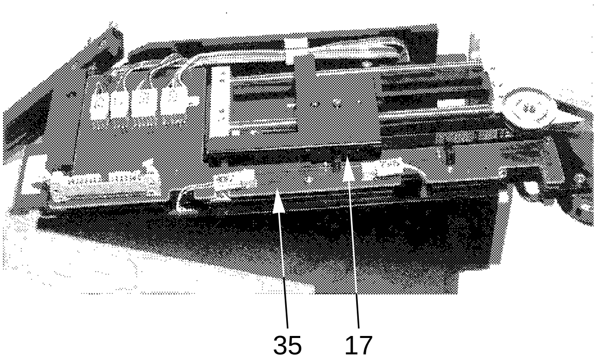
NOTE
Reassembly instructions are the reverse of disassembly instructions unless otherwise stated.

5.4.4.1 Connector board P2 item 35

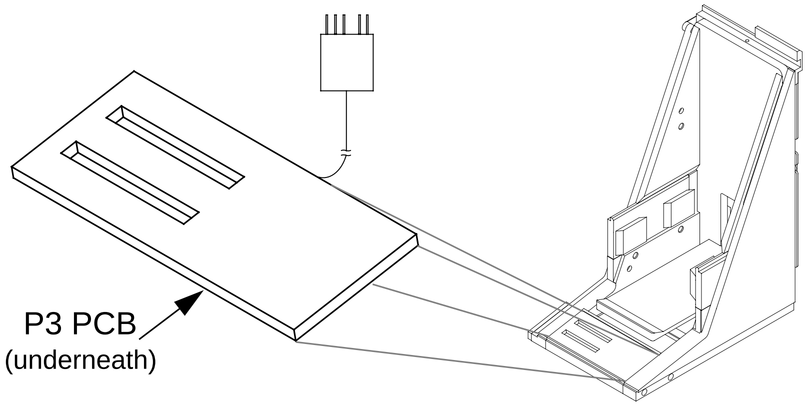
Unscrew and remove *flag item 17* (1 screw).

Disconnect the 6 connectors on connector board P2.

Unscrew (6 screws) and replace connector board P2.



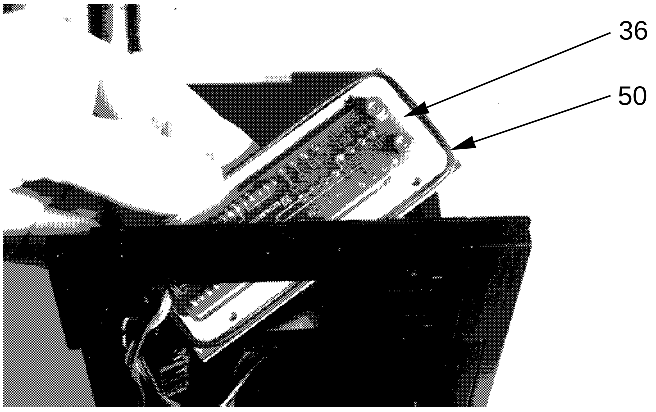
5.4.4.2 Connector board P3 item 36



Disconnect *connector board P3 item 36* on connector board P2 (connector 2301).

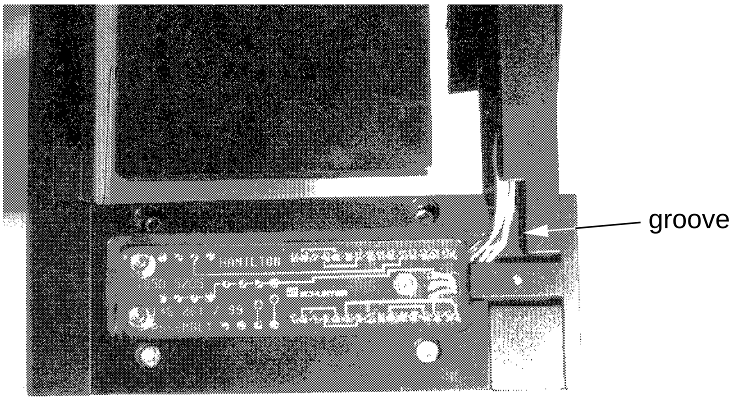
Unscrew *sensor holder 1 item 3* (2 screws).

Now unscrew connector board P3 (4 screws from underneath) and replace.



When remounting, make sure *O-ring item 50* is correctly positioned.

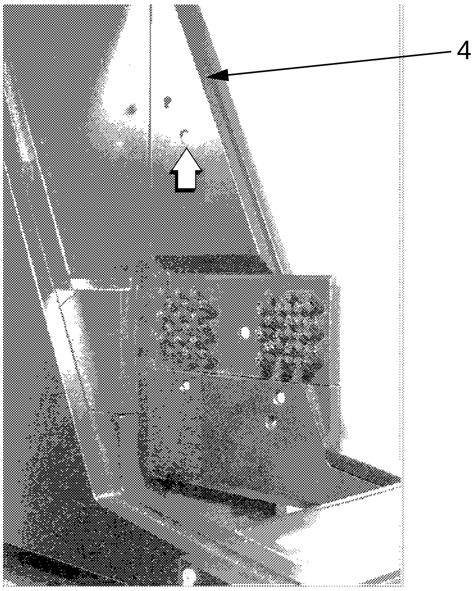
Place cable in groove provided.



5.4.4.3 Connector board P4 item 37

Disconnect *connector board P4 item 37* on connector board P2 (connector 2306).

Unscrew *sensor holder 4 item 6* (1 screw).



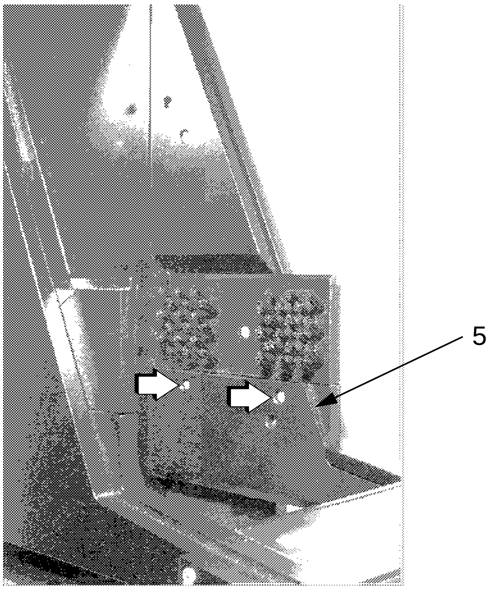
Now unscrew connector board P4 from sensor holder 4 and replace.

When remounting, ensure that *O-ring item 51* is correctly positioned.

5.4.4.4 Connector board P5 item 38

Disconnect *connector board P5 item 38* on *connector board P2 item 35* (connector 2305).

Unscrew *sensor holder 3 item 5* (2 screws).



Now unscrew connector board P5 from sensor holder 3 and replace.

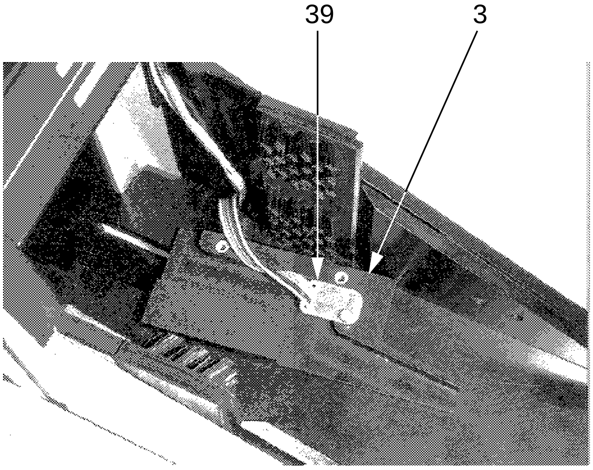
When remounting, ensure that the *O-ring item 51* is correctly positioned.

5.4.4.5 Connector board P6 item 39

Disconnect *connector board P6 item 39* on *connector board P2 item 35* (connector 2303).

Unscrew *sensor holder 1 item 3* (2 screws).

Now unscrew connector board P6 from sensor holder 1 and replace.

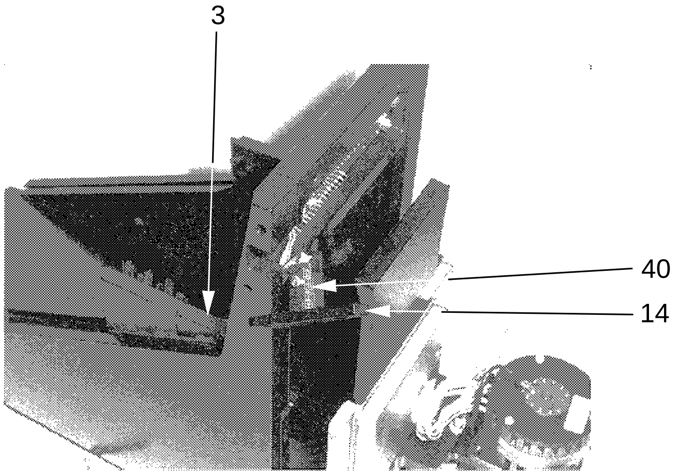


When remounting, ensure that *O-ring item 51* is correctly positioned.

When remounting *sensor holder 1 item 3*, make sure that the sensor cable is not being squeezed.

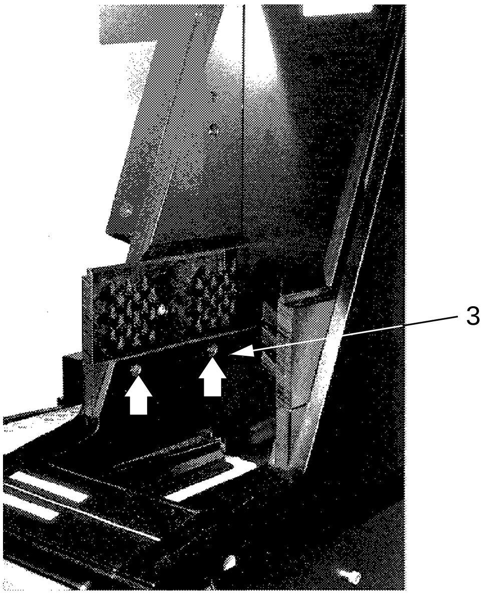
5.4.4.6 Transparent cover sensor item 40

Unscrew *sensor holder 5 item 14*.



Unscrew *transparent cover sensor item 40* from sensor holder 5 (1 screw).

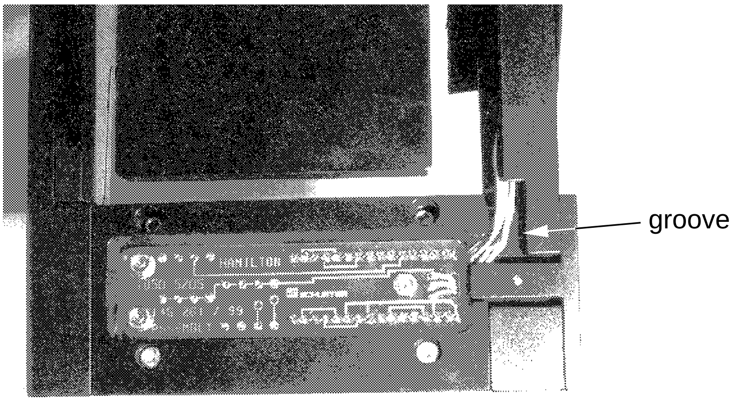
Unscrew *sensor holder 1 item 3* (2 screws).



Disconnect transparent cover sensor on connector board P2 (connector 2307) and replace.

When remounting *sensor holder 1 item 3*, ensure that sensor cable is not being squeezed!

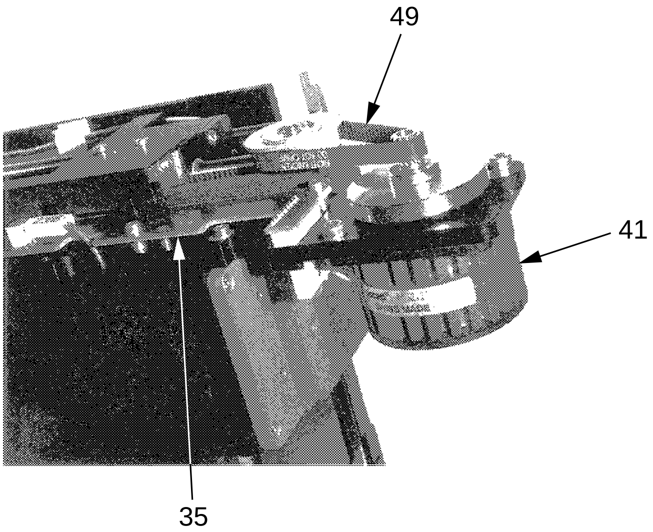
Place cable in groove provided.



5.4.4.7 Step motor item 41, gear belt item 49

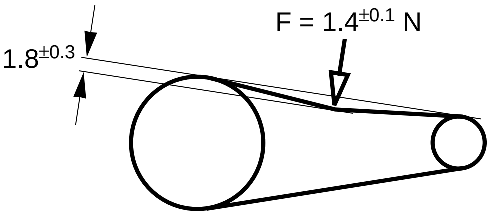
Unplug motor cable on *connector board P2 item 35*, free cable from cable clamps.

Unscrew (2 screws) and replace *step motor item 41*.



For *gear belt item 49*, slacken the 2 motor fixing screws and replace belt.

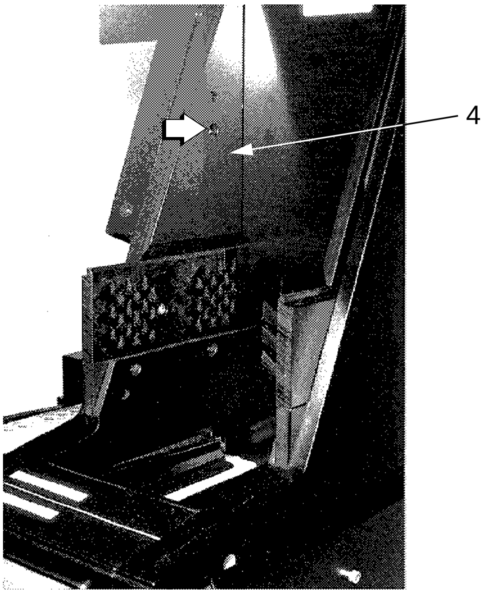
Belt tension:



5.4.4.8 Connector board P9 item 42

Disconnect *connector board P9 item 42* on *connector board P2 item 35* (connector 2302).

Unscrew *sensor holder 2 item 4*.

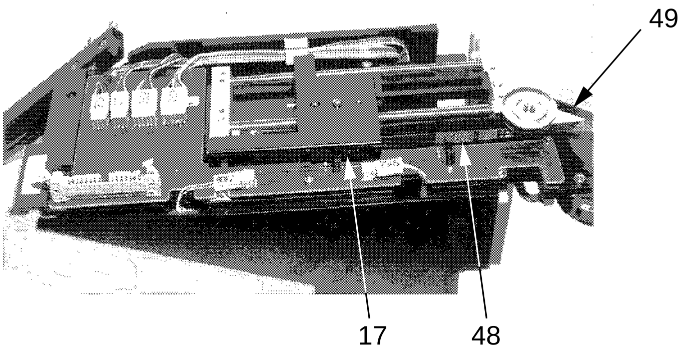


Now unscrew connector board P9 from sensor holder 2 and replace.

When remounting, ensure that *O-ring item 51* is correctly positioned.

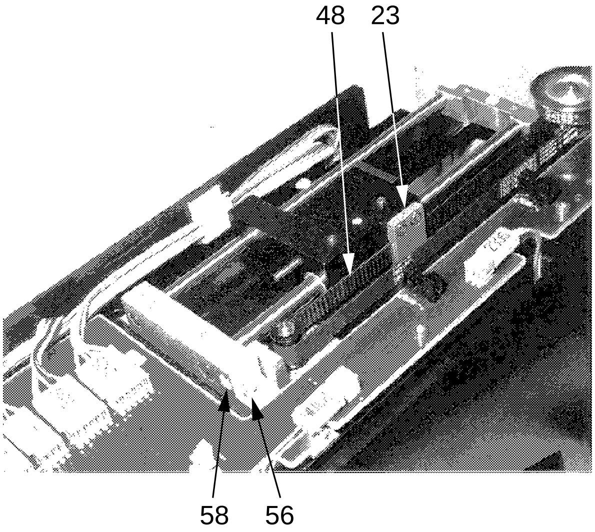
5.4.4.9 Gear belt item 48

Unscrew and remove *flag item 17* (1 screw).



Unscrew and remove *belt clamp item 23*.

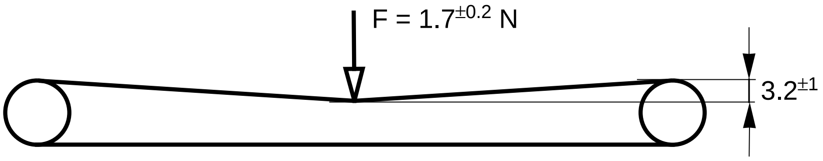
Slacken belt by first unfastening screw item 56 and then belt tensioning screw item 58.



Now slip *gear belt item 49* off motor pulley and remove it.

Gear belt item 48 can now be taken off and replaced.

Belt tension:



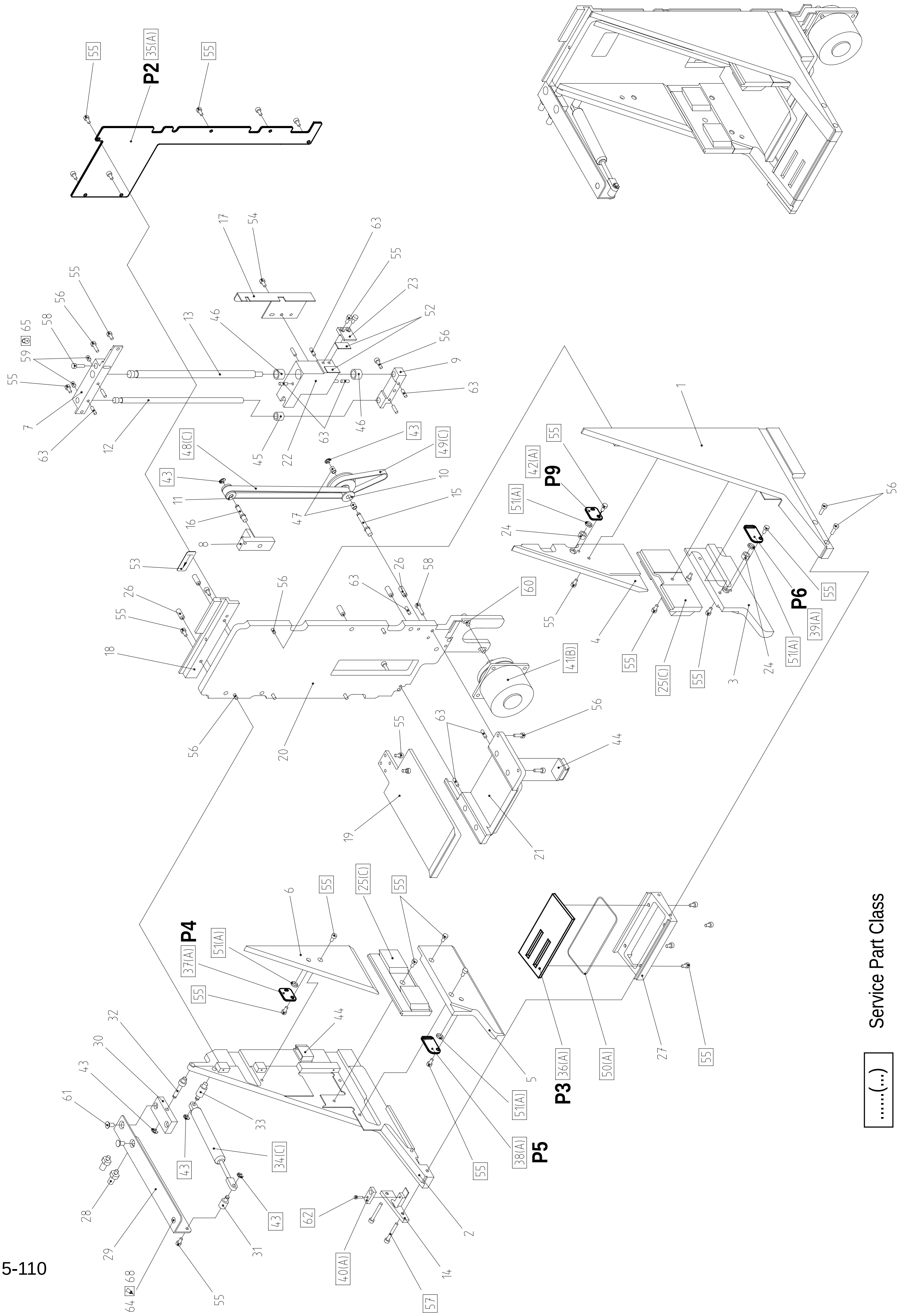
5.4.5 Spare Parts List

EXIT STACK 147740 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147741	SEITENPLATTE RECHTS	00	1	1.000	
147742	SEITENPLATTE LINKS	00	2	1.000	
147743	SENSORHALTER 1	00	3	1.000	
147744	SENSORHALTER 2	00	4	1.000	
147745	SENSORHALTER 3	00	5	1.000	
147746	SENSORHALTER 4	00	6	1.000	
148197	SUPPORT OBEN GROSS	00	7	1.000	
148202	SUPPORT OBEN KLEIN	00	8	1.000	
148198	SUPPORT UNTEN	00	9	1.000	
148199	ZAHNRIEMENRAD	00	10	1.000	
148201	UMLENKROLLE	00	11	1.000	
148203	SICHERUNGSWELLE	00	12	1.000	
148204	F<HRUNGSWELLE	00	13	1.000	
148214	SENSORHALTER 5	00	14	1.000	
148207	TRAEGERWELLE	00	15	1.000	
148208	ROLLENTRfGER	00	16	1.000	
148209	MASSSTAB	00	17	1.000	
147775	LEISTE	00	18	1.000	
148210	HEBEB<HNE	00	19	1.000	
148211	GRUNDPLATTE	00	20	1.000	
148212	BODENPLATTE	00	21	1.000	
148205	SCHLITTEN	00	22	1.000	
148213	KLEMME	00	23	1.000	
253021	GLEITLAGER 5D10/8X5	00	24	2.000	
147769	B<RSTE	00	25	2.000	C
147773	PRINTAUFLAGE	00	26	5.000	
147776	RAHMEN EXIT-STACK	00	27	1.000	
147645	MITNEHMER	00	28	2.000	
148196	GASFEDER-HALTER RECHTS	00	29	1.000	
147894	LAGERUNG	00	30	1.000	
147896	GASFEDER-BEFESTIGUNG 2	00	31	1.000	
147654	SCHARNIERWELLE	00	32	1.000	
147895	GASFEDER-BEFESTIGUNG 1	00	33	1.000	
256500	GAS-FEDER	00	34	1.000	C
146259	CONNECTORBOARD P2 PCB	00	35	1.000	A
146261	CONNECTORBOARD P3 PCB	00	36	1.000	A
146263	CONNECTORBOARD P4 PCB	00	37	1.000	A
146265	CONNECTORBOARD P5 PCB	00	38	1.000	A
146266	CONNECTORBOARD P6 PCB	00	39	1.000	A
146328	TRANSPARENT COVER SENSOR HS03	00	40	1.000	A
146321	STEP MOTOR P SM50	00	41	1.000	B
146268	CONNECTORBOARD P9 PCB	00	42	1.000	A
413024	SICHERUNGSSCHEIBE ROSTFREI 3,2	00	43	5.000	
361019	KABELBEF. SES-CT	00	44	2.000	
148206	GLEITLAGER	00	45	1.000	

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
279365	SINTERBZ.LAGER 8E7/11R7/ 8 MM	00	46	2.000	
279368	GLEITLAGER ZYL. 4X 5 X 6	00	47	2.000	
258019	ZAHNRIEMEN MXL Z= 175 X 5/16”	00	48	1.000	B
258064	ZAHNRIEMEN MXL Z= 79 X 1/4”	00	49	1.000	C
254110	O-RING 76.00X2.00 VITON	00	50	1.000	A
254111	O-RING 5.00X1.50 VITON	00	51	4.000	A
7281122	KLEBBAND 2-SEITIG D=0,8 B=9	00	52	0.034	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	53	1.000	
420507	ZYL-SCHRAUBE M 3 X 6 DIN84A	00	54	1.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	55	30.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	56	11.000	
400270	ZYL-SCHR.M 3X25 DIN912 A2	00	57	2.000	
400265	ZYL-SCHR.M 3X12 DIN912 A2	00	58	3.000	
405462	GEW.STIFT M4 X 5 VERZ DIN916	00	59	2.000	
400303	ZYL-SCHR.M 4X10 DIN912 A2	00	60	2.000	
403491	SENKSCHRAUBE M 4X 8 DIN7991	00	61	2.000	
401016	ZYL. SCHRAUBE M2X8 DIN84A	00	62	1.000	
279250	ZYL-STIFT 3.0X10 VSM12771B	00	63	12.000	
279329	PUFFER D = 6,5 X 1,6 TRANSP	00	64	1.000	A
511006	LOCTITE 222 50mL	00	65	0.000	T
511030	SICOMET 77	00	66	0.000	
255385	IDENTIFIKATIONSLABEL ORANGE	00	150	1.000	

5.4.6 3D Drawing Exit Stack: Dwg. 147 740 revision 02

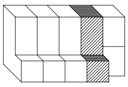

55
35(A)
P2
55
17
54
63
55
23
52
56
9
63
55
56
58
59 ⊡ 65
55
7
63
13
46
12
45
22
63
46
43
49(C)
48(C)
43
11
10
16
47
15
8
1
55
42(A)
P9
51(A)
24
56
53
26
55
18
56
63
26
58
60
55
4
55
25(C)
55
3
24
P6
55
51(A)
39(A)
41(B)
56
20
55
63
56
44
19
21
6
55
25(C)
55
P4
51(A)
37(A)
55
32
44
30
43
33
61
43
34(C)
28
29
31
43
62
40(A)
14
57
2
55
51(A)
38(A)
P5
5
P3
36(A)
50(A)
27
55
64 ⊡ 68
55

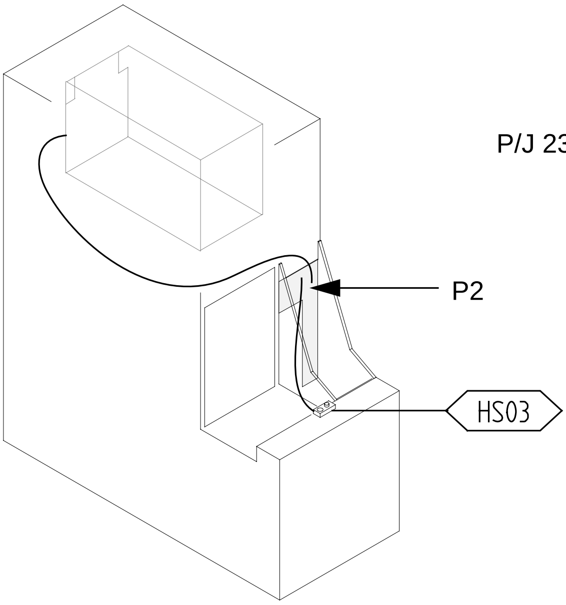
Service Part Class

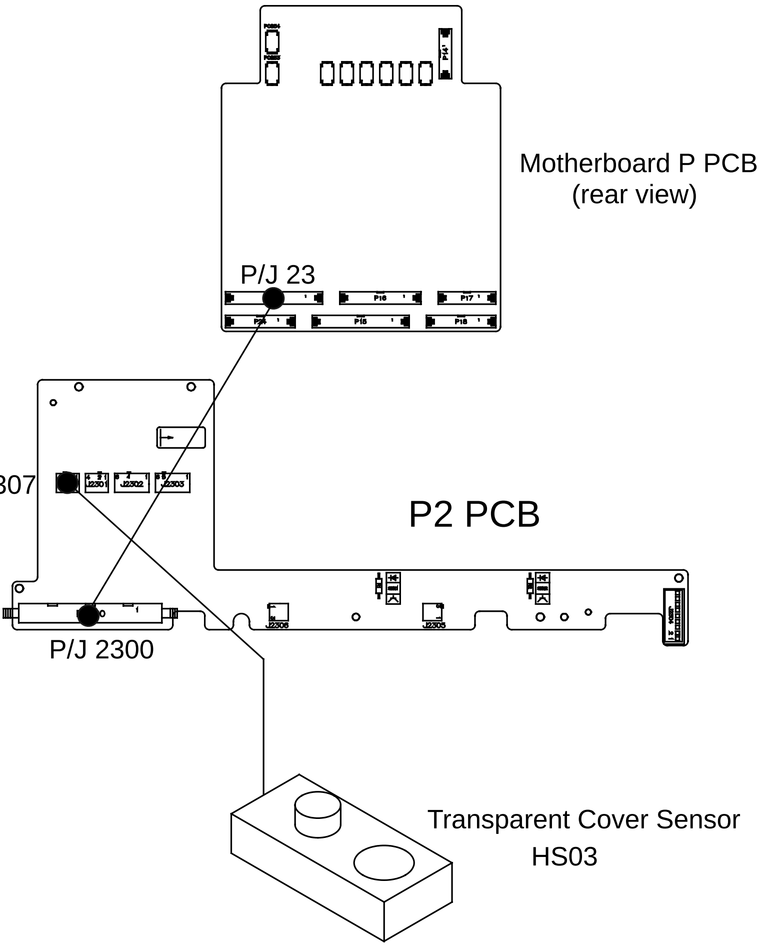
......(...)

5.4.7 Troubleshooting

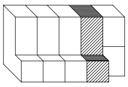
Module: End
Assembly: Exit Stack
Sensor: Hall-Switch HS03
Transparent Cover Sensor
Boards: P2, Motherboard P
Error Message:

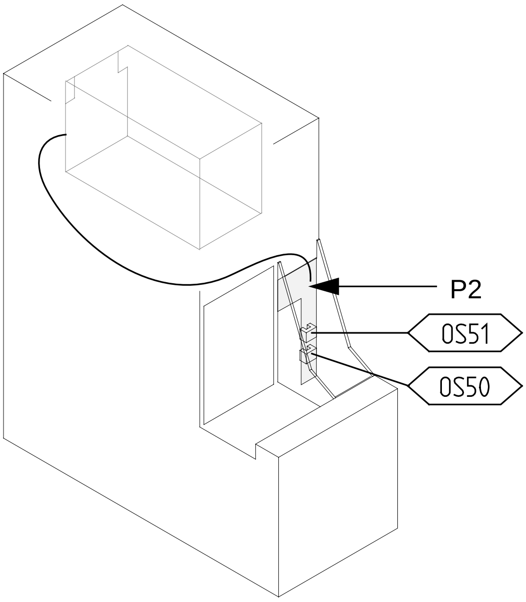


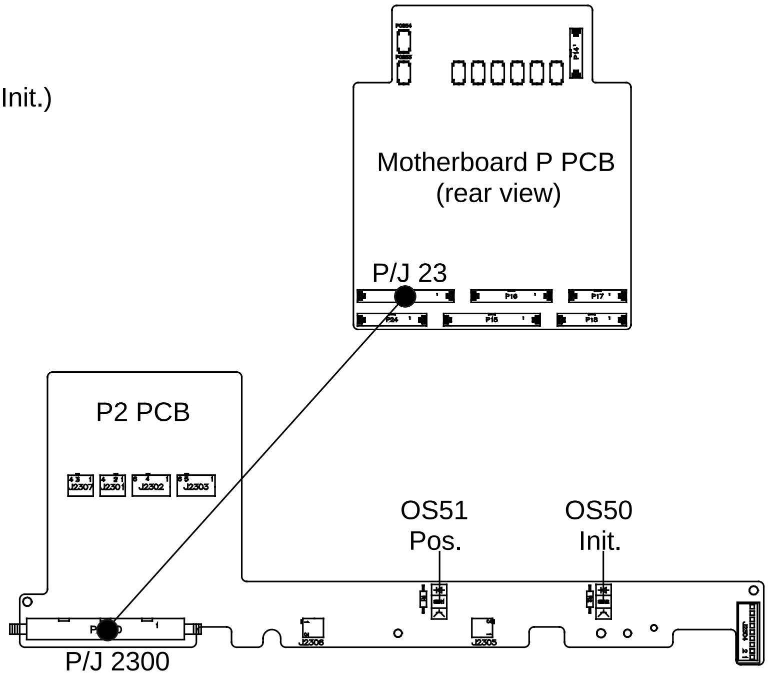



Motherboard P PCB
(rear view)
P/J 23
P/J 2307
P2 PCB
P/J 2300
Transparent Cover Sensor
HS03

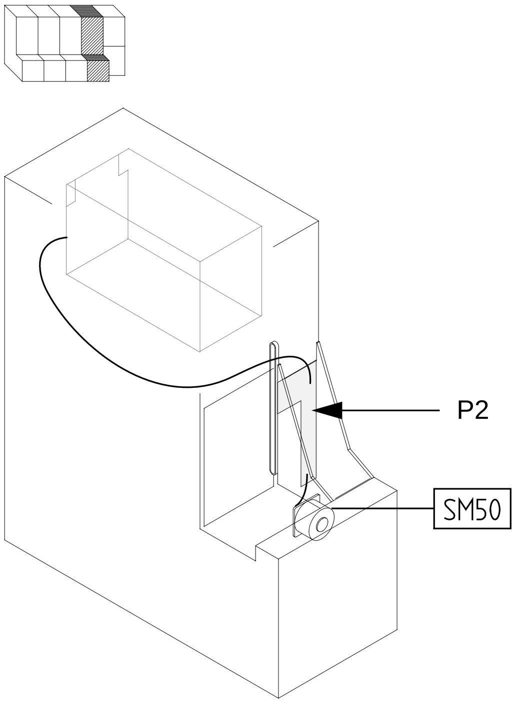
Module: End
Assembly: Exit Stack
Sensors: Optical-Switches OS50 (Stack Init.)
OS51 (Stack Position)
Boards: P2, Motherboard P
Error Message:

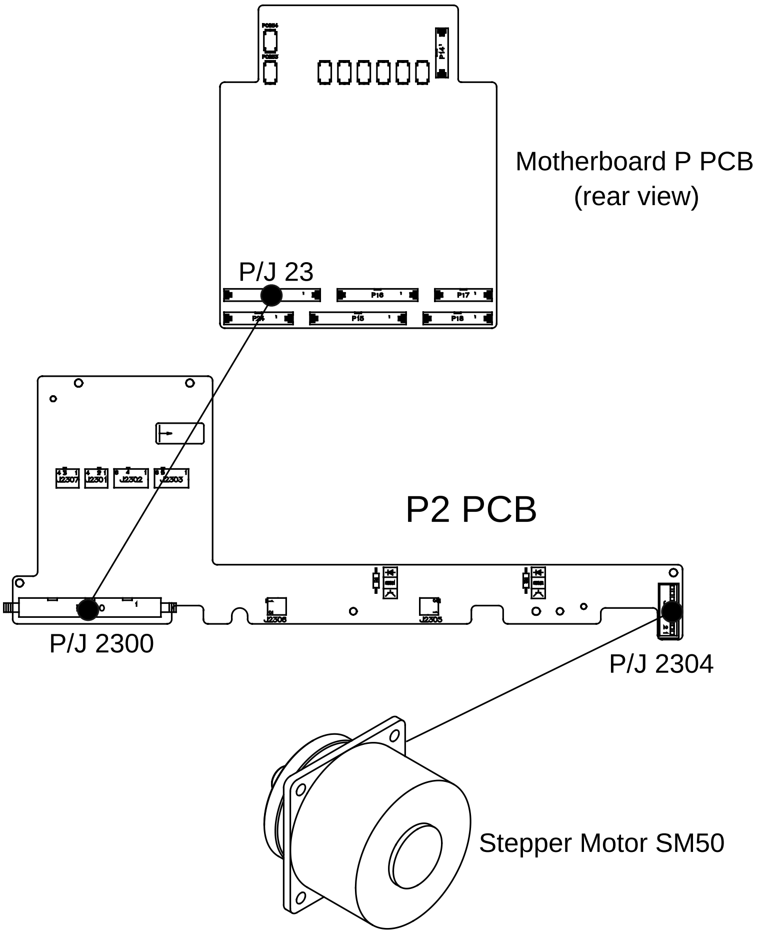



P2
OS51
OS50

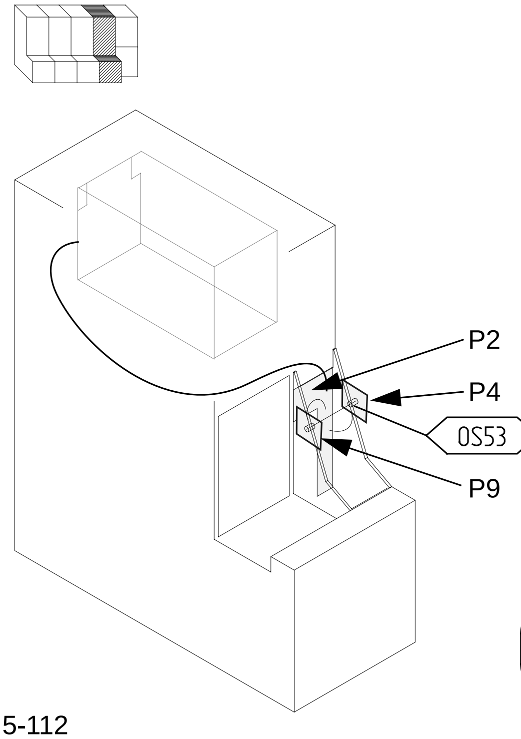

Motherboard P PCB
(rear view)
P/J 23
P2 PCB
OS51
Pos.
OS50
Init.
P/J 2300

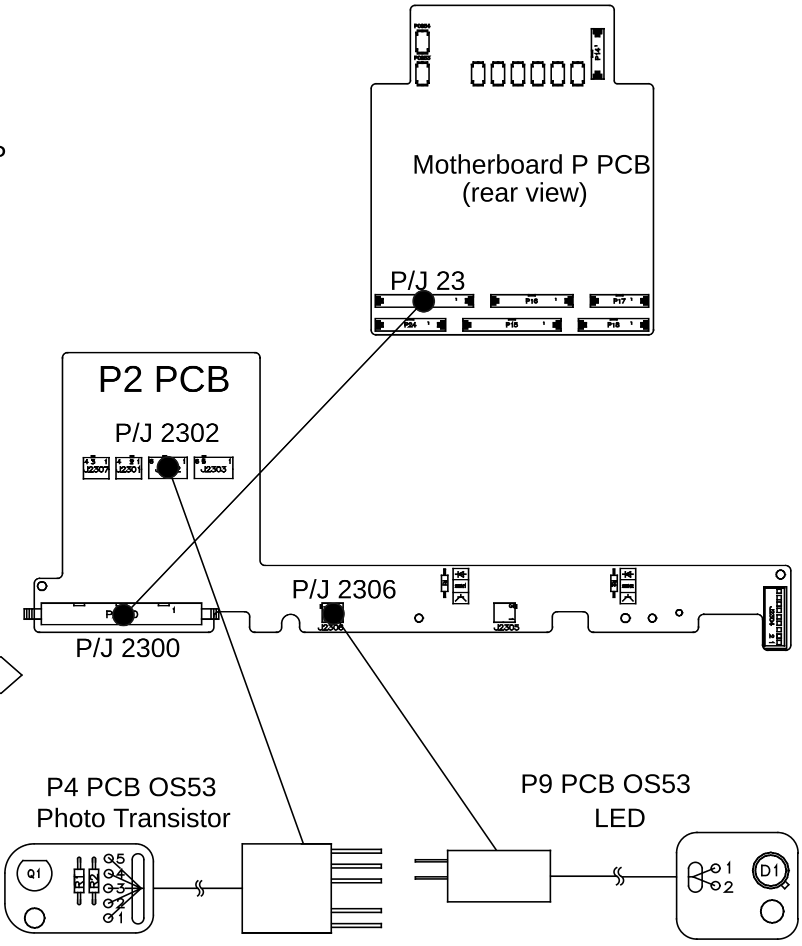
Module: End
Assembly: Exit Stack
Actor: Stepper Motor SM50
Exit Stack Lift
Boards: P2, Motherboard P
Error Message:



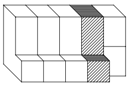

Motherboard P PCB
(rear view)
P/J 23
P2 PCB
P/J 2300
P/J 2304
Stepper Motor SM50

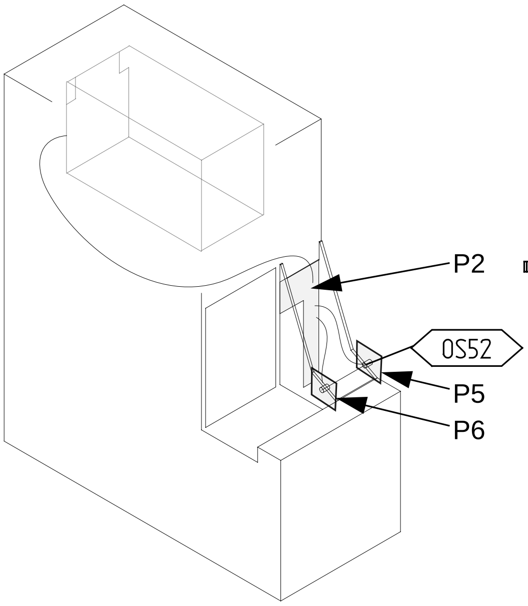
Module: End
Assembly: Exit Stack
Sensor: Optical-Switch OS53
(Stack Level)
Boards: P2, P4, P9, Motherboard P
Error Message:

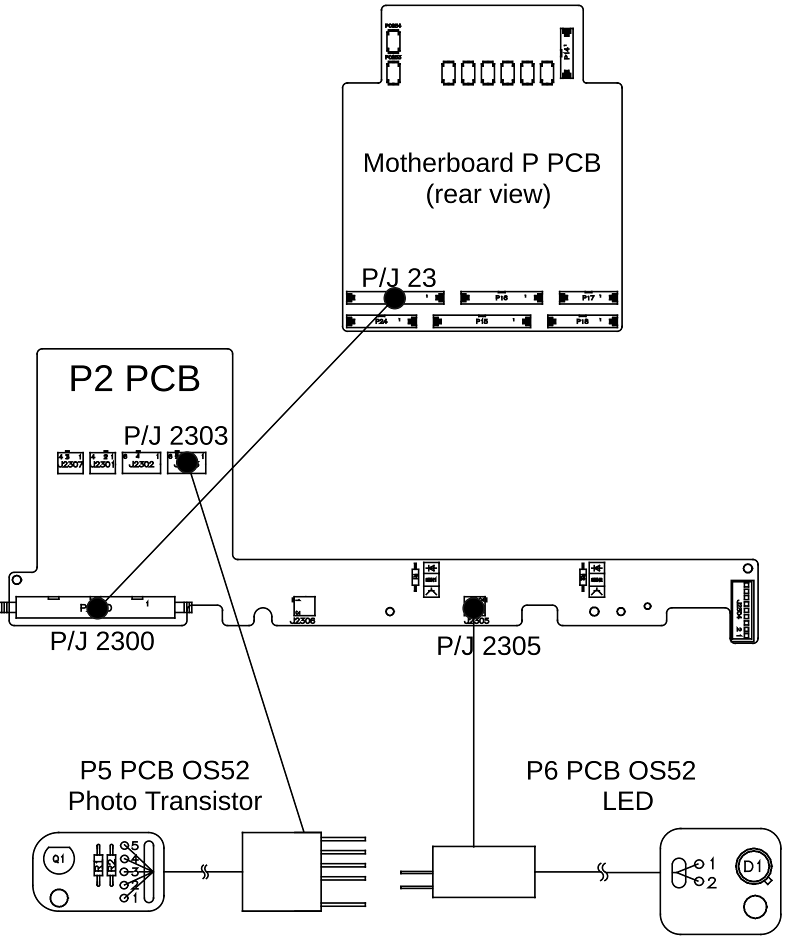

P2
P4
OS53
P9


Motherboard P PCB
(rear view)
P/J 23
P2 PCB
P/J 2302
P/J 2306
P/J 2300
P4 PCB OS53
Photo Transistor
P9 PCB OS53
LED

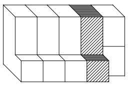
Module: End
Assembly: Exit Stack
Sensor: Optical-Switch OS52
(MTP Presence)
Boards: P2, P5, P6, Motherboard P
Error Message:

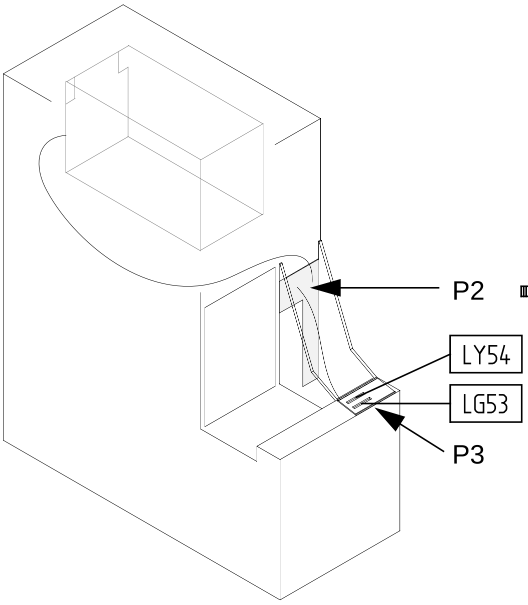


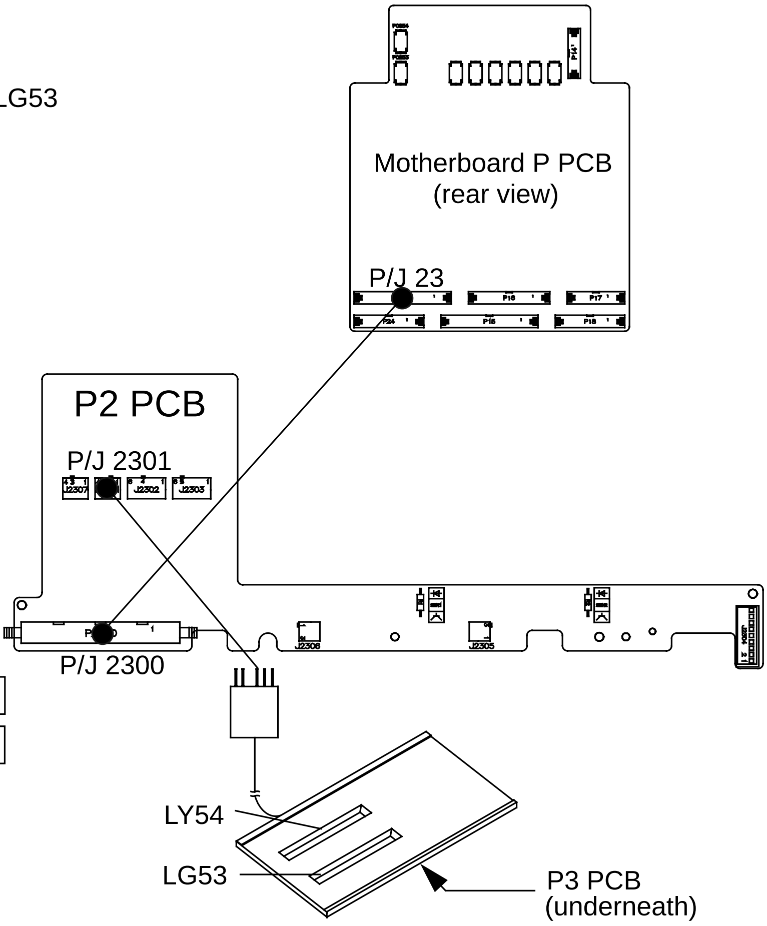

P2
OS52
P5
P6


Motherboard P PCB
(rear view)
P/J 23
P2 PCB
P/J 2303
J2307
J2301
J2302
P/J 2300
P/J 2305
P5 PCB OS52
Photo Transistor
P6 PCB OS52
LED
Q1
5
4
3
2
1
D1
1
2

Module: End
Assembly: Exit Stack
Actors: Signal Lamps, LED Green LG53
LED Yellow LY54
Boards: P3, Motherboard P
Error Message:




P2
LY54
LG53
P3


Motherboard P PCB
(rear view)
P/J 23
P2 PCB
P/J 2301
J2307
J2302
J2303
P/J 2300
J2306
J2305
LY54
LG53
P3 PCB
(underneath)

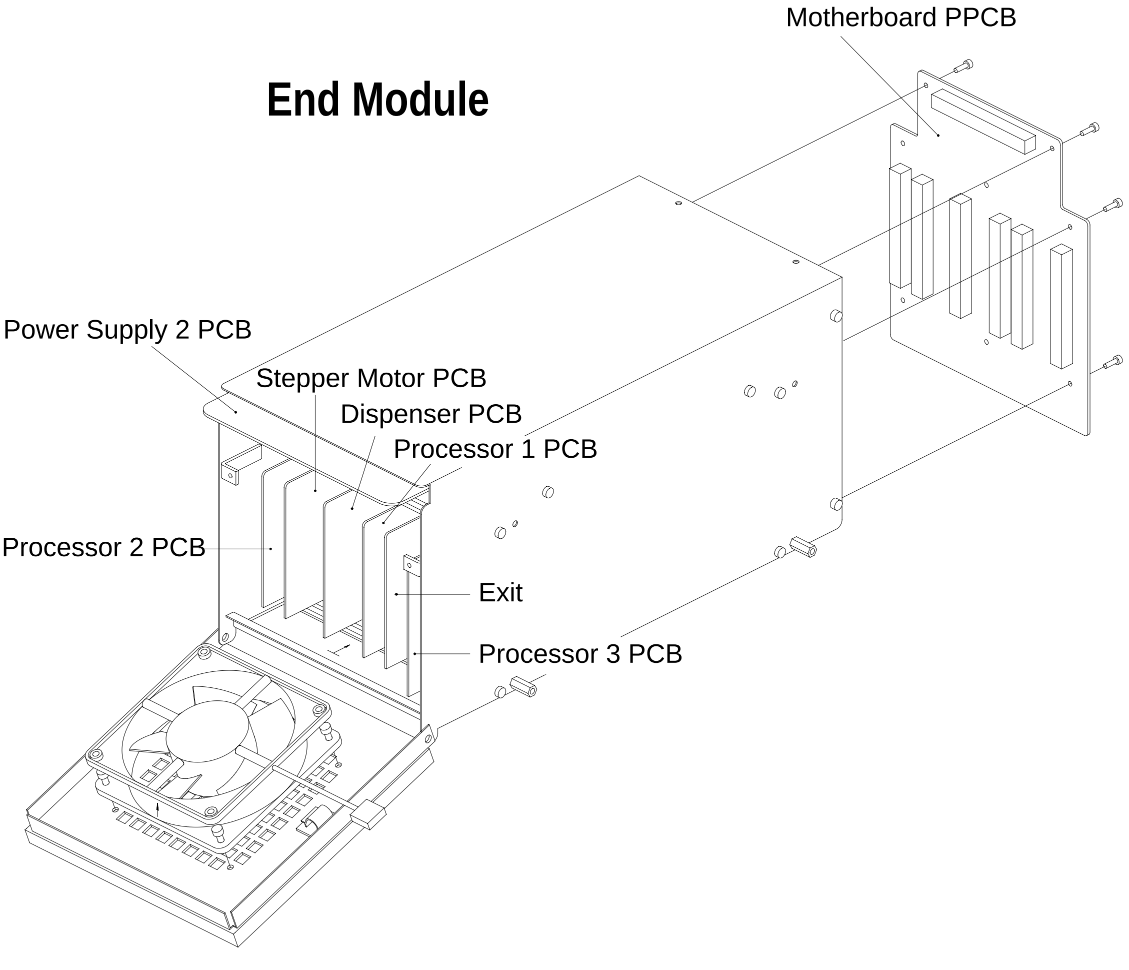
Electronic Rack

(End Module)

- Motherboard P PCB
  146 170
- Power Supply 2 PCB
  146 172 (See W/D Elect. Rack)
- Processor 1 PCB
  146.160 (See Entry Elect. Rack)
- Processor 2 PCB
  146 162 (See Entry Elect. Rack)
- Processor 3 PCB
  146 163 (See Entry Elect. Rack)
- Stepper Motor PCB
  146 174 (See Entry Elect. Rack)
- Dispenser PCB
  146 180 (See W/D Elect. Rack)
- Exit PCB
  146 186

5.5 Electronic Rack

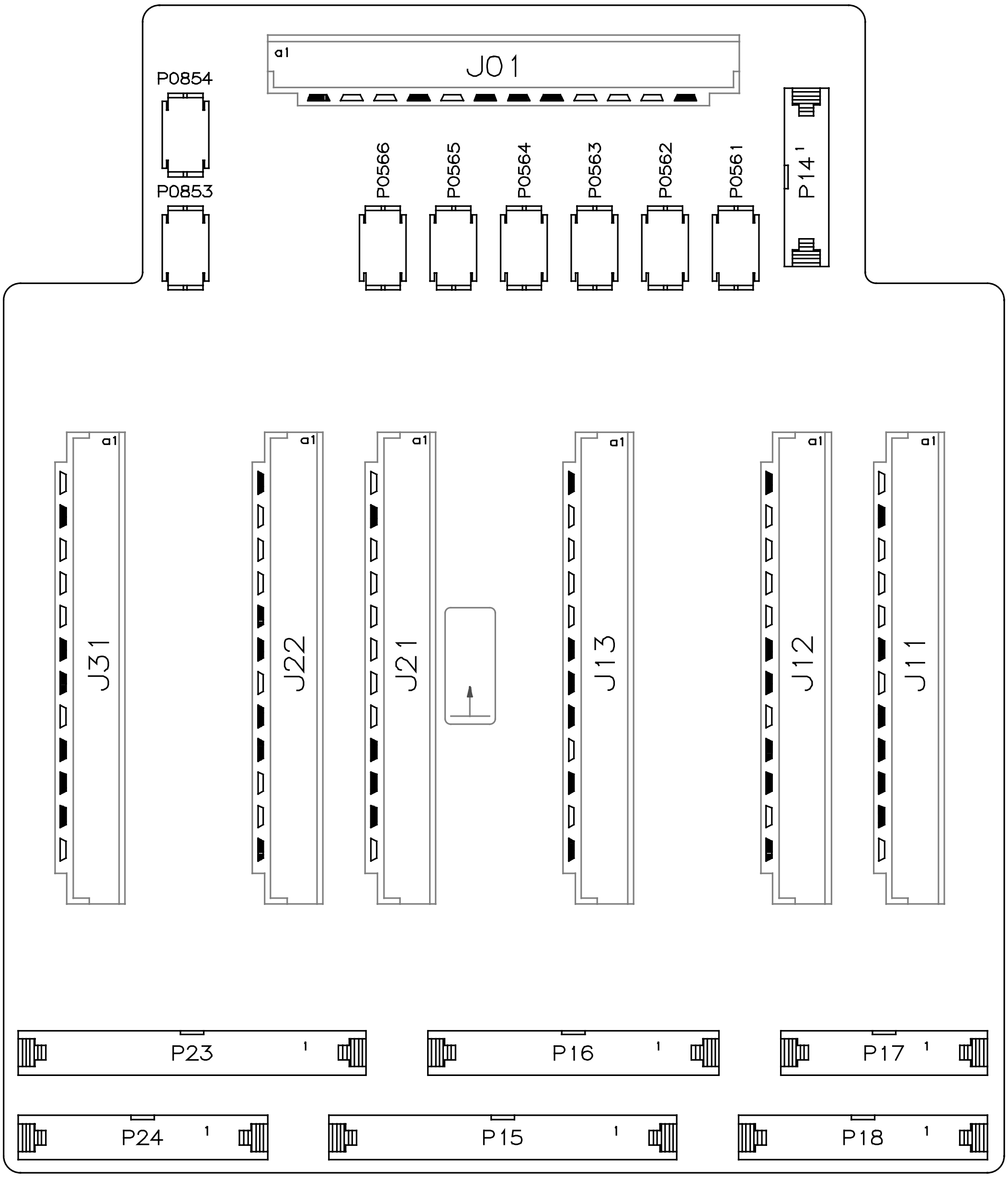
End Module


Motherboard PPCB
Power Supply 2 PCB
Stepper Motor PCB
Dispenser PCB
Processor 1 PCB
Processor 2 PCB
Exit
Processor 3 PCB

5.5.1 Motherboard P PCB p/n 146 170

Component Layout: Dwg No. 146 170 version 00

Rear View of PCB


J01
a1
P0854
P0853
P0566
P0565
P0564
P0563
P0562
P0561
P14
1
J31
J22
J21
J13
J12
J11
P23
P16
P17
P24
P15
P18

5.5.2 Power Supply 2 PCB p/n 146 172

See Entry Electronic Rack.

5.5.3 Processor 1 PCB p/n 146 160

See Entry Electronic Rack.

5.5.4 Processor 2 PCB p/n 146 162

See Entry Electronic Rack.

5.5.5 Processor 3 PCB p/n 146 163

See Entry Electronic Rack.

5.5.6 Stepper Motor PCB p/n 146 174

See Entry Electronic Rack.

5.5.7 Dispenser PCB p/n 146 180

See Washer / Dispenser Electronic Rack

5.5.8 Exit PCB p/n 146 186

FUNCTIONAL DESCRIPTION

Overview

The exit PCB is driven by the microprocessor PCB of the exit system. The exit PCB operates the sensors and activators of the exit-stack assembly as well as the main-shuttle assembly.

There are three different groups of functions:

- ❒ Operation of 2 stepper motors SE01 (Main Shuttle) and SM50 (exit-stack Lift). Step-counting monitoring is ensured by the stepper motor SE01.
- ❒ Operation of the transmitter and signal processing for the MTP - detector OS52 (checks if MTP is in the manipulation position), and OS53 (checks how many MTPs are in the exit stack).
- ❒ Operation of additional sensors and activators, namely:

2 hall sensors (HS01 main initialization and HS03 transparent cover) including interrupt - generation for HS03.

1 emergency stop switch (MS99, Emergency Stop) including debounce and interrupt generation for HS03.

2 drivers for LED, like OS50 (main initialization of the exit-stack lift) and OS51 (exit-stack position).

Operates the signal lamps: green (LG53) or yellow (LY54).

Stepper Motor Operation

The two stepper motor operations are in accordance with the conception and production of the stepper motor PCB P/N 146 174. Two stepper motors can be driven in the micro step mode. Both operations are controlled by stepper motors SE01 (main shuttle) and SM50 (exit-stack lift). Stepper motor SE01 has a disc-magnet stepper motor with integrated hall-sensors (ESCAP PP 520-258004). The hall sensors, together with the counter - IC HP HCTL2020, enable position control and step count control (full step). In this hardware configuration, the ESCAP-motor can also be driven in the brush-less DC mode.

Stepper motor operations are designed in such a way so that other stepper motors without position controls can be driven.

Stepper motor operation involves the following components:

- ❒ I/O - port 82C55A-2: -PB0, PB1, and PC0-PC6 ports for the stepper motor SE01. Only PB0, PB1, and PC0 ports are used during micro step operation, -PB2, PB3, and PB4 ports for the stepper motor SM50.

- ❐ Monitoring of position and step count with HP HCTL2020 counter
- ❐ 2 stepper motor end stages, each involves 2 D/A - converters (PM7224), 2 “full bridge drivers” L6202, and “current controllers” L6506
- ❐ Latch 74HC75 to synchronize the I/O port 82C55A-2 with the D/A - converters. (Synchronization of the phase polarity with the phase-current intensity)

MTP Detector

The MTP-detector portion of the exit PCB provides functions that allow detection of MTPs in the exit-stack as well as detection of MTPs in the manipulation position. The conception and realization of the MTP detector is the same as that for the incubator PCB P/N 146178. The detection of an MTP occurs when the beam of light transmitted over a transmitter-receiver is broken. The signal source develops a square-wave signal with a duty-cycle of 50% and a frequency of 15.625kHz (PWM-frequency of the 80C196-processor, P2.5/PWM0). The square-wave signal is converted into a sine-wave transmission signal by a low-pass filter. The detector output of the tone-decoder LM 567 CN changes its logical condition depending on the signal-amplitude of the received signals. It is sent to the PA7 port (MTP_OS) of the I/O - IC 82C55-2. The status of the sensors may be asked after a delay-time of 50 ms. A change in the detection threshold or the quantitative seizure of the reception signal is made possible through a controlled amplifier (combination OP-Amp and D/A - converter PM7524), through which a selectable part of the transmission signal is added to the reception signal. This compensation signal is phase locked to the transmission signal.

With the port PB6 (_MEASURE_ADJUST_MTP_OS) the sensor mode is determined.

The transmitter (signal formation and driver) and the receiver (amplifier, signal filter, and adder for the compensating signal) are independently integrated onto the exit PCB. Both LEDs (OS53, OS52), which are connected in series, and the photo transistors (OS53, OS52), are fitted onto the P4, P5, P6, and P9 connector boards. To switch between both readings (MTP exit-stack-level reading and MTP detection reading), the multiplexer DG202 is used over the 82C55A-2 PB7 (_OS52_OFF_MTP_OS) port. The MTP detector is switched on and off with the PB5 port (_ON_OFF_MTP_OS).

Additional Sensors and Activators

Altogether, two sensors with logical outputs are read over ports PA0 and PA3 of the I/O - IC 82C55A2. Besides the optical switches, OS50 (main initialization of the exit-stack lift) and OS51 (exit-stack position), the initialization sensor HS01 (main shuttle) and the transparent-cover sensor (HS03) are additionally processed. The last-named signal is also sent as an interrupt signal to the HSI.2 port of the exit microprocessors and to the HSI.3 port (P0.7/ACH7/EXTINT) of the communication microprocessors. The debounced pause button signal (MS99) is also sent as an interrupt signal to the HSI.1 port of the exit microprocessors and to the P0.7/ACH7/EXTINT port of the communication microprocessors. Furthermore, both signals are sent to their respective ports-- PA1 or the PA6 of the I/O - IC.

Additionally, four drivers are available for the operation of LEDs. Two of which (ports Q0 and Q1 of the latch - IC 74HC273) are controlled by optical switches OS 50 and OS51.

The other two drivers are used for turning the signal lamps (LG53 and LY54) on and off. The light intensity of the respective lamps are regulated with the pulse-width-modulators, P1.3/PWM1 for the green signal lamp and P1.4/PWM2 for the yellow signal lamp. The puls frequency of both operations is 15.625 kHz. The amount of time for switching on the signal lamps may not be more than 30% (PWM value: 0…77) for green lamps, and 40% (PWM value: 0...102) for yellow lamps. The blinker frequencies for the green and yellow signal lamps may be regulated (default: blinker frequency = 2Hz).

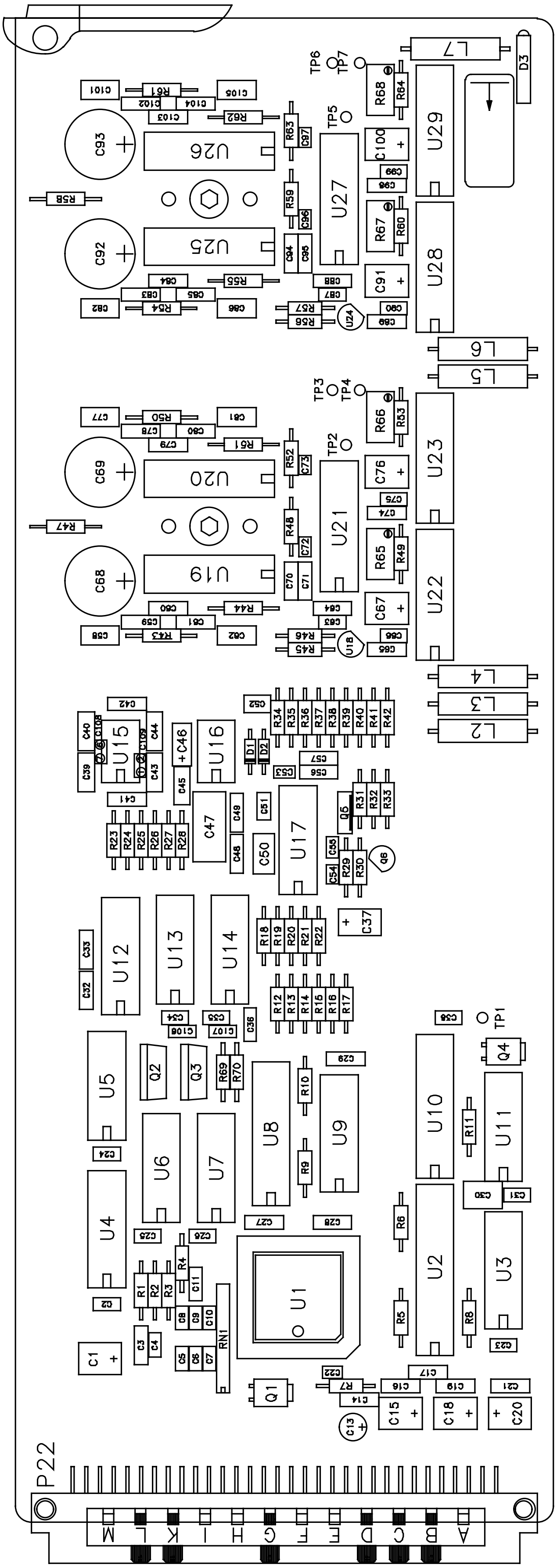
Signaling of the signal lamps:

Constant green	:	hand manipulation allowed
Blinking green	:	hand manipulation needed (exit-stack full or remove the MTP from the manipulation position)
Constant yellow	:	operation is waiting
Blinking yellow	:	operation in progress

Refer to the drawing on the following page:

- ❐ Exit PCB (component layout): Dwg No. 146 186

Exit PCB (component layout): Dwg No. 146 186 revision 03


L7
D3
TP6
TP7
TP5
R68
R64
U29
C101
R61
C105
C102
C104
C103
R62
R63
C97
C100
C93
U26
U27
C99
C98
R58
R59
C96
R67
R60
C92
U25
C94
C95
U28
C84
R55
C88
C91
C83
C85
C87
C82
R54
C86
R57
C90
U24
R56
C89
L6
L5
TP3
TP4
R66
R53
C77
R50
C81
C78
C80
U23
C79
R51
R52
C73
TP2
C76
C69
U20
C75
C74
R47
R48
C72
U21
R65
R49
C70
C71
C68
U19
U22
C60
R44
C64
C67
C59
C61
C63
C58
R43
C62
R46
C66
U18
R45
C65
L4
L3
L2
C42
C52
R34
R35
R36
R37
R38
R39
R40
R41
R42
C40
C108
C44
C46
U15
C109
U16
D1
D2
C57
C39
C43
C53
C56
C45
R31
R32
R33
C41
C51
Q5
C49
C47
U17
R23
R24
R25
R26
R27
R28
C48
C50
C55
C54
R29
R30
Q6
R18
R19
R20
R21
R22
C37
C33
U12
U13
U14
C32
R12
R13
R14
R15
R16
R17
C34
C35
C36
C38
TP1
C108
C107
U5
Q2
Q3
R69
R70
R10
C29
Q4
U10
R11
U11
U8
U9
C24
U6
U7
R9
C30
C31
U4
C27
C28
R6
C25
C26
R4
U2
U3
R1
R2
R3
C11
U1
C2
C8
C9
C10
RN1
R5
R8
C3
C4
C23
C1
C5
C6
C7
C22
C17
R7
C16
C19
C21
Q1
C14
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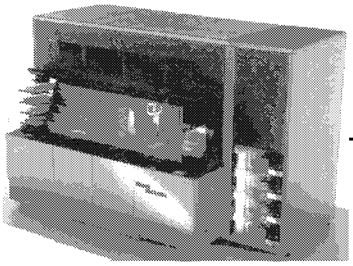


Instrument Framework

Block Diagram Instrument
(see next page)

Container Stack Raw
147 549

Chassis
147 150

Main Shuttle Rail

Small	Medium	Large
147 596	147 601	147 610

Transparent Cover

Small	Medium	Large
147 920	147 921	147 922

Waste Cap
148 335

Instrument Assembly
& Disassembly
(See chapter 1)

CHAPTER 6 INSTRUMENT FRAMEWORK

6.1 Instrument Error Codes

6.1.1 Entry System Error Codes

Error Code	Error type/description	Detectors	Criteria	Remarks
01	+/-15VDC power fail	voltage control	+/-14.5…15.7	analog circuits disturbed
03	+35VDC power fail	voltage control	+22…48	mains disturbance
04	+35VDC123 power fail	voltage control	94…107% of +35VDC	stepper motors, incubator slots (heated)
05	+35VDC456 power fail	voltage control	94…107% of +35VDC	stepper motors, incubator slots (heated)
06	+VPP	voltage control in download mode	+11.4…12.6	programming voltage Flash EPROM
07	+5VDC power fail	voltage control	+4.75…5.25	logic voltage
08	Tx Own Node Id	CAN-driver		message was transmitted to itself
09	not communication member error	CAN-driver		
10	lock time-out error	CAN-driver		emptying of data buffer too slow, danger of overwriting old data
11	RxTx error active	CAN-chip		error in bus, error registered
12	RxTx error passive	CAN-chip		error in bus, error not registered
13	wrong data in Intel Hex Row	download functions	Intel check sum incorrect	repeat line or generate Intel Hex file new and load again
14	Flash EPROM not programmable	download functions	programming error	exchange Flash EPROMs or processor card
15	Flash EPROM not erasable	download functions	delete error	exchange Flash EPROMs or processor card
16	EPROM checksum error	EPROM surveillance	checksum incorrect	unsafe function
17	Flash EPROM checksum error	Flash EPROM surveillance	checksum incorrect	unsafe function
18	RAM-test error	RAM-test	test unsuccessful	system is not working
19	RAM calibration values error	RAM surveillance	checksum incorrect, not calibrated	unsafe function
20	wrong program loaded	download functions	incorrect program identification	system is not working
21	undefined command	syntax check	syntax error	unknown command
22	undefined parameter	syntax check	syntax error	unknown parameter
23	parameter out of range	syntax check	syntax error	parameter range exceeded

Error Code	Error type/description	Detectors	Criteria	Remarks
24	no parallel function on level 2	function status release adm.	status error	not allowed parallelity of functions due to risk of mechanical collision
25	not pre-initialized	function (init) status	status error	no pre-initialization carried out
26	not initialized	function (init) status	status error	no initialization carried out
27	no parallel function on level 0	function status release adm.	status error (except C0)	not allowed parallelity of functions due to risk of mechanical collision
28	no parallel function on level 1	function status release adm.	status error	not allowed parallelity of functions due to risk of mechanical collision
29	+12VDC power fail	voltage control		LEDs, rack fans
30	barcode hardware error	RS232 interface	no connection possible	not working
31	barcode data overwrite	barcode reader and microprocessor	administration	existing barcode data has been overwritten with the last reading command
32	barcode not readable	barcode reader	n attempts to read barcode	dirt on barcode or barcode reader
33	plate detection defect	plate presence sensor	calibration	not working
34	front tower temperature too high	temperature sensor	> 39°C	test endangered
35	front tower temperature too low	temperature sensor	< 11°C	test endangered
36	temperature sensors front tower defect	temperature sensor		temperature sensors outside measuring range
38	rear tower temperature too high	temperature sensor		only after init
39	rear tower temperature too low	temperature sensor		only after init
40	temperature sensors rear tower defect	temperature sensor		temperature sensors outside measuring range
41	initialization position not found	step control or initialization sensor	> max. steps or step loss	not working
43	step lost	step control		- doors open - jammed in tower - collided with main shuttle - plate dropped
44	no plate holding	plate presence check and microprocessor	wrong detection pattern	plate not loaded
45	still plate holding	plate presence check and microprocessor	wrong detection pattern	plate not deposed
46	initialization position not found	initialization sensors	>max. step number	not working
47	step lost	ruler		wrong position
48	initialization position not found	initialization sensors	>max. step number	not working
49	step lost	ruler		wrong position
52	front tower temperature regulator off			slot temperature was set without switching-on the temperature regulation
53	rear tower temperature regulator off			slot temperature was set without switching-on the temperature regulation
90	user interrupt	load button		entry lift movement interrupted by user (LED was flashing yellow)

Error Code	Error type/description	Detectors	Criteria	Remarks
97	plate detection defect	plate presence	calibration	not working
98	user release	load button		entry lift movement not allowed (LED was green)
99	stack blocked	plate presence sensor	wrong detection pattern	only blocked
91	communication error to exit	time-out		exit system not working
92	no parallel function	main shuttle is busy with exit command		repeat command after while
93	main shuttle blocked	step control		repeat command
94	main shuttle not initialized	initialization sensor		initialize main shuttle
95	step lost	ruler		wrong position
96	initialization position not found	initialization sensors	>max. step number	not functioning

6.1.2 Incubator System Error Codes

Error Code	Error type/description	Detectors	Criteria	Remarks
01	+/-15VDC power fail	voltage control	+/-14.5…15.7	analog circuits disturbed
03	+35VDC power fail	voltage control	+22…48	mains disturbance
04	+35VDC123 power fail	voltage control	94…107% of +35VDC	stepper motors, incubator slots (heated)
05	+35VDC456 power fail	voltage control	94…107% of +35VDC	stepper motors, incubator slots (heated)
06	+VPP	voltage control in download mode	+11.4…12.6	programming voltage Flash EPROM
07	+5VDC power fail	voltage control	+4.75…5.25	logic voltage
08	TxOwn Node Id	CAN-driver		message was transmitted to itself
09	not communication member error	CAN-driver		
10	lock time-out error	CAN-driver		emptying of data buffer too slow, danger of overwriting old data
11	RxTx error active	CAN-chip		error in bus, error registered
12	RxTx error passive	CAN-chip		error in bus, error not registered
13	wrong data in Intel Hex Row	download functions	Intel check sum incorrect	repeat line or generate Intel Hex file new and load again
14	Flash EPROM not programmable	download functions	programming error	exchange Flash EPROMs or processor card
15	Flash EPROM not erasable	download functions	delete error	exchange Flash EPROMs or processor card
16	EPROM checksum error	EPROM surveillance	checksum incorrect	unsafe function
17	Flash EPROM checksum error	Flash EPROM surveillance	checksum incorrect	unsafe function

Error Code	Error type/description	Detectors	Criteria	Remarks
18	RAM-test error	RAM-test	test unsuccessful	system is not working
19	RAM calibration values error	RAM surveillance	checksum incorrect, not calibrated	unsafe function
20	wrong program loaded	download functions	incorrect program identification	system is not working
21	undefined command	syntax check	syntax error	unknown command
22	undefined parameter	syntax check	syntax error	unknown parameter
23	parameter out of range	syntax check	syntax error	parameter range exceeded
24	no parallel function on level 2	function status release adm.	status error	not allowed parallelity of functions due to risk of mechanical collision
25	not pre-initialized	function (init) status	status error	no pre-initialization carried out
26	not initialized	function (init) status	status error	no initialization carried out
27	no parallel function on level 0	function status release adm.	status error (except C0)	not allowed parallelity of functions due to risk of mechanical collision
28	no parallel function on level 1	function status release adm.	status error	not allowed parallelity of functions due to risk of mechanical collision
29	+12VDC power fail	voltage control		LEDs, rack fans
33	plate detection defect	plate presence sensor	calibration	not working
34	front tower temperature too high	temperature sensor		test endangered
35	front tower temperature too low	temperature sensor		test endangered
36	temperature sensors front tower defect	temperature sensor		temperature sensors outside measuring range
38	rear tower temperature too high	temperature sensor		only after init
39	rear tower temperature too low	temperature sensor		only after init
40	temperature sensors rear tower defect	temperature sensor		temperature sensors outside measuring range
41	initialization position not found	step control or initialization sensor	> max. steps or step loss	not working
43	step lost	step control		- doors open - jammed in tower - collided with main shuttle - plate dropped
44	no plate holding	plate presence check and microprocessor	wrong detection pattern	plate not loaded
45	still plate holding	plate presence check and microprocessor	wrong detection pattern	plate not deposed
46	initialization position not found	initialization sensors	> max. step number	not working
47	step lost	ruler		wrong position
48	initialization position not found	initialization sensors	> max. step number	not working
49	step lost	ruler		wrong position

Error Code	Error type/description	Detectors	Criteria	Remarks
52	front tower temperature regulator off			slot temperature was set without switching-on the temperature regulation
53	rear tower temperature regulator off			slot temperature was set without switching-on the temperature regulation

6.1.3 Dispenser System Error Codes

Error Code	Error type/description	Detectors	Criteria	Remarks
01	+/-15VDC power fail	voltage control	+/-14.5…15.7	analog circuits disturbed
02	+24VDC power fail	voltage control	+20…24	photometer voltage, external pump station
03	+35VDC power fail	voltage control	+22…48	mains disturbance
04	+35VDC123 power fail	voltage control	94…107% of +35VDC	stepper motors, incubator slots (heated)
05	+35VDC456 power fail	voltage control	94…107% of +35VDC	stepper motors, incubator slots (heated)
06	+VPP	voltage control in download mode	+11.4…12.6	programming voltage Flash EPROM
07	+5VDC power fail	voltage control	+4.75…5.25	logic voltage
08	TxOwn Node Id	CAN-driver		message was transmitted to itself
09	not communication member error	CAN-driver		
10	lock time-out error	CAN-driver		emptying of data buffer too slow, danger of overwriting old data
11	RxTx error active	CAN-chip		error in bus, error registered
12	RxTx error passive	CAN-chip		error in bus, error not registered
13	wrong data in Intel Hex Row	download functions	Intel check sum incorrect	repeat line or generate Intel Hex file new and load again
14	Flash EPROM not programmable	download functions	programming error	exchange Flash EPROMs or processor card
15	Flash EPROM not erasable	download functions	delete error	exchange Flash EPROMs or processor card
16	EPROM checksum error	EPROM surveillance	checksum incorrect	unsafe function
17	Flash EPROM checksum error	Flash EPROM surveillance	checksum incorrect	unsafe function
18	RAM-test error	RAM-test	test unsuccessful	system is not working
19	RAM calibration values error	RAM surveillance	checksum incorrect, not calibrated	unsafe function
20	wrong program loaded	download functions	incorrect program identification	system is not working
21	undefined command	syntax check	syntax error	unknown command
22	undefined parameter	syntax check	syntax error	unknown parameter

Error Code	Error type/description	Detectors	Criteria	Remarks
23	parameter out of range	syntax check	syntax error	parameter range exceeded
24	no parallel function on level 2	function status release adm.	status error	not allowed parallelity of functions due to risk of mechanical collision
25	not pre-initialized	function (init) status	status error	no pre-initialization carried out
26	not initialized	function (init) status	status error	no initialization carried out
27	no parallel function on level 0	function status release adm.	status error (except C0)	not allowed parallelity of functions due to risk of mechanical collision
28	no parallel function on level 1	function status release adm.	status error	not allowed parallelity of functions due to risk of mechanical collision
29	+12VDC power fail	voltage control		LEDs, rack fans
30	hardware error	RS232 interface	no connection possible	not working
31	barcode data overwrite	barcode reader and microprocessor	administration	existing barcode data has been overwritten with the last reading command
41	initialization position not found	step control or initialization sensor	> max. steps or step loss	not working
43	step lost	step control		wrong position
79	step lost	step control		wrong position
80	initialization position not found	step control or initialization sensor	> max. step or step loss	not working
81	step lost	ruler		wrong position
82	initialization position not found	initialization sensor	> max. step	not working
83	step lost	step control		wrong position
84	initialization position not found	step control or initialization sensor	> max. steps or step loss	not working
85	improper dispensing	LLD and microprocessor	no level after re-dispensing into container	improper dispensing (bad syringe, foam, etc.)
86	untight syringe	LLD	tightness check	untight syringe
87	improper aspiration	LLD and microprocessor	no level after aspiration	not enough reagent due to improper aspiration
88	no reagent detected	LLD and z-position	no detection and lowest position	empty container
89	reagent LLD defect	LLD	calibration	not working
91	syringe leaking	LLD and microprocessor	level because of drops	leaking syringe
92	no syringe stored	syringe tip→ sensor and z-direction→ position	no detection and ok	no syringe deposed
94	no syringe grabbed	syringe tip→ sensor and z-direction→ position	no detection and ok	no syringe grabbed
95	step lost	step control		wrong position
96	initialization position not found	initialization sensor	step control or initialization sensor	not working

Error Code	Error type/description	Detectors	Criteria	Remarks
98	command interrupted	drawer switch		command was interrupted before completion

6.1.4 Washer System Error Codes

Error Code	Error type/description	Detectors	Criteria	Remarks
08	TxOwn Node Id	CAN-driver		message was transmitted to itself
09	not communication member error	CAN-driver		
10	lock time-out error	CAN-driver		emptying of data buffer too slow, danger of overwriting old data
11	RxTx error active	CAN-chip		error in bus, error registered
12	RxTx error passive	CAN-chip		error in bus, error not registered
13	wrong data in Intel Hex Row	download functions	Intel check sum incorrect	repeat line or generate Intel Hex file new and load again
14	Flash EPROM not programmable	download functions	programming error	exchange Flash EPROMs or processor card
15	Flash EPROM not erasable	download functions	delete error	exchange Flash EPROMs or processor card
16	EPROM checksum error	EPROM surveillance	checksum incorrect	unsafe function
17	Flash EPROM checksum error	Flash EPROM surveillance	checksum incorrect	unsafe function
18	RAM-test error	RAM-test	test unsuccessful	system is not working
19	RAM calibration values error	RAM surveillance	checksum incorrect, not calibrated	unsafe function
20	wrong program loaded	download functions	incorrect program identification	system is not working
21	undefined command	syntax check	syntax error	unknown command
22	undefined parameter	syntax check	syntax error	unknown parameter
23	parameter out of range	syntax check	syntax error	parameter range exceeded
24	no parallel function on level 2	function status release adm.	status error	not allowed parallelity of functions due to risk of mechanical collision
26	not initialized	function (init) status	status error	no initialization carried out
27	no parallel function on level 0	function status release adm.	status error (except C0)	not allowed parallelity of functions due to risk of mechanical collision
28	no parallel function on level 1	function status release adm.	status error	not allowed parallelity of functions due to risk of mechanical collision
41	not initialized	initialization sensor	> max. steps	not initialized by dispenser
43	step lost	step control		wrong position
61	syntax error from dispenser			firmware error

Error Code	Error type/description	Detectors	Criteria	Remarks
63	strip position parameter out of range		administration	software error
64	manifold missing	contact	open contacts	manifold missing
65	wash shell not in rinse position	sensor	detected	wash shell jammed
66	manifold not calibrated		administration	calibrate manifold
67	water separator overflow	level sensor	detected	check waste container
68	not enough liquid in containers	level sensors	detected	
70	EPROM checksum error external pump station processor	EPROM surveillance	wrong checksum	unsafe function
71	RAM-test error external pump station processor	RAM test	errors in RAM test	not working
72	RS232 communication to external pump station disturbed	RS232 surveillance	n tries for communication	no communication possible parts of the system not working
73	communication error to dispenser	CAN surveillance	time-out	not working
74	overload	pump regulation		not working
75	not connected	pump regulation		not working
77	not connected	pump regulation		not working
78	overload	pump regulation		not working
79	not connected	pump regulation		not working
80	no parallel function with module transport	function status	status error	not allowed parallelity since module transport is occupied by dispenser
83	EPROM checksum error external pump station processor	EPROM surveillance	wrong checksum	unsafe function
84	RAM-test error external pump station processor	RAM test	errors in RAM test	not working
85	RS232 communication to external pump station disturbed	RS232 surveillance	n tries for communication	no communication possible parts of the system not working
86	step lost	ruler		wrong position
87	initialization position not found	initialization sensor	> max. steps	not working
89	wash shell overflow	level sensor	detected	
90	improper manifold mounting	manifold positioning control	detected	improper manifold mounting
91	improper aspirating during dispensing	manifold LLD	some levels still present on check position	possibility that one or more wells are overfilled
92	blocked aspirating needle	manifold LLD	some levels still present on aspirating position	
93	improper aspirating	manifold LLD	> time-out time	level still detected: - vacuum pump defect - blocked or defect tubing - blocked exhaust
94	blocked dispensing needle	manifold LLD	check profile exceeded	
95	improper wash liquid dispensing	manifold LLD	> time-out time	no level detected: - filter blocked - wash pump defective - blocked or defect tubing
96	manifold LLD defect	manifold LLD	calibration	during LLD reference measurement

Error Code	Error type/description	Detectors	Criteria	Remarks
97	fluid connector not in rinse position	rinse position sensor and microprocessor	rinse position not detected and rinse command	fluid connector not in position ➞ not working
98	fluid connector not in wash position	wash position sensor and microprocessor	wash position not detected and wash command	fluid connector not connected to container ➞ not working
99	wash procedure running	wash position sensor and microprocessor	detected and busy	container was changed during washing

6.1.5 Exit System Error Codes

Error Code	Error type/description	Detectors	Criteria	Remarks
08	TxOwn Node Id	CAN-driver		message was transmitted to itself
09	not communication member error	CAN-driver		
10	lock time-out error	CAN-driver		emptying of data buffer too slow, danger of overwriting old data
11	RxTx error active	CAN-chip		error in bus, error registered
12	RxTx error passive	CAN-chip		error in bus, error not registered
13	wrong data in Intel Hex Row	download functions	Intel check sum incorrect	repeat line or generate Intel Hex file new and load again
14	Flash EPROM not programmable	download functions	programming error	exchange Flash EPROMs or processor card
15	Flash EPROM not erasable	download functions	delete error	exchange Flash EPROMs or processor card
16	EPROM checksum error	EPROM surveillance	checksum incorrect	unsafe function
17	Flash EPROM checksum error	Flash EPROM surveillance	checksum incorrect	unsafe function
18	RAM-test error	RAM-test	test unsuccessful	system is not working
19	RAM calibration values error	RAM surveillance	checksum incorrect, not calibrated	unsafe function
20	wrong program loaded	download functions	incorrect program identification	system is not working
21	undefined command	syntax check	syntax error	unknown command
22	undefined parameter	syntax check	syntax error	unknown parameter
23	parameter out of range	syntax check	syntax error	parameter range exceeded
24	no parallel function on level 2	function status release adm.	status error	not allowed parallelity of functions due to risk of mechanical collision
25	not pre-initialized	function (init) status	status error	no pre-initialization carried out
26	not initialized	function (init) status	status error	no initialization carried out

Error Code	Error type/description	Detectors	Criteria	Remarks
27	no parallel function on level 0	function status release adm.	status error (except C0)	not allowed parallelity of functions due to risk of mechanical collision
28	no parallel function on level 1	function status release adm.	status error	not allowed parallelity of functions due to risk of mechanical collision
91	illegal position parameter			wrong parameter for configuration
92	exit stack plate detection defective	plate presence sensor	calibration	not working
93	step lost	ruler		not working
94	initialization position not found	initialization sensor	> max. step number	not working
95	step lost	step control		wrong position
96	initialization position not found	step control or initialization sensor	> max. steps or step loss	not working
97	bad stacking	plate presence sensor and micro-processor	sensor reports while stack moving downwards	function blocked
98	manipulation platform plate detection defective	plate presence sensor	calibration	not working
99	still holding plate	plate presence sensor and micro-processor	sensor reports while stack going downwards	function blocked

6.1.6 Communication System Error Codes

Error Code	Error type/description	Detectors	Criteria	Remarks
08	TxOwn Node Id	CAN-driver		message was transmitted to itself
09	not communication member error	CAN-driver		
10	lock time-out error	CAN-driver		emptying of data buffer too slow, danger of overwriting old data
11	RxTx error active	CAN-chip		error in bus, error registered
12	RxTx error passive	CAN-chip		error in bus, error not registered
13	wrong data in Intel Hex Row	download functions	Intel check sum incorrect	repeat line or generate Intel Hex file new and load again
14	Flash EPROM not programmable	download functions	programming error	exchange Flash EPROMs or processor card
15	Flash EPROM not erasable	download functions	delete error	exchange Flash EPROMs or processor card
16	EPROM checksum error	EPROM surveillance	checksum incorrect	unsafe function
17	Flash EPROM checksum error	Flash EPROM surveillance	checksum incorrect	unsafe function
18	RAM-test error	RAM-test	test unsuccessful	system is not functioning
20	wrong program loaded	download functions	incorrect program identification	system is not functioning

Error Code	Error type/description	Detectors	Criteria	Remarks
21	undefined command	syntax check	syntax error	unknown command
22	undefined parameter	syntax check	syntax error	unknown parameter
23	parameter out of range	syntax check	syntax error	parameter range exceeded
86	modules not connected	connector surveillance		not all modules correctly plugged-in
87	RS232 communication to photometer disturbed	RS232 surveillance	n trials for communication	communication impossible, parts of the system not working
88	RS232 communication to PC disturbed	RS232 surveillance	n trials for communication	communication impossible, parts of the system not working
89	CAN communication in Communication System disturbed	CAN surveillance	n trials for communication	communication impossible, parts of the system not working
90	CAN communication to Exit System disturbed	CAN surveillance	n trials for communication	communication impossible, parts of the system not working
91	CAN communication to Dispenser 0 disturbed	CAN surveillance	n trials for communication	communication impossible, parts of the system not working
92	CAN communication to Washer 2 disturbed	CAN surveillance	n trials for communication	communication impossible, parts of the system not working
93	CAN communication to Dispenser 2 disturbed	CAN surveillance	n trials for communication	communication impossible, parts of the system not working
94	CAN communication to Washer 1 disturbed	CAN surveillance	n trials for communication	communication impossible, parts of the system not working
95	CAN communication to Dispenser 1 disturbed	CAN surveillance	n trials for communication	communication impossible, parts of the system not working
96	CAN communication to Incubator 2 disturbed	CAN surveillance	n trials for communication	communication impossible, parts of the system not working
97	CAN communication to Incubator 1 disturbed	CAN surveillance	n trials for communication	communication impossible, parts of the system not working
98	CAN communication to Entry System disturbed	CAN surveillance	n trials for communication	communication impossible, parts of the system not working
99	undefined address	syntax check	syntax check	unknown address

6.1.7 Photometer System Error Codes

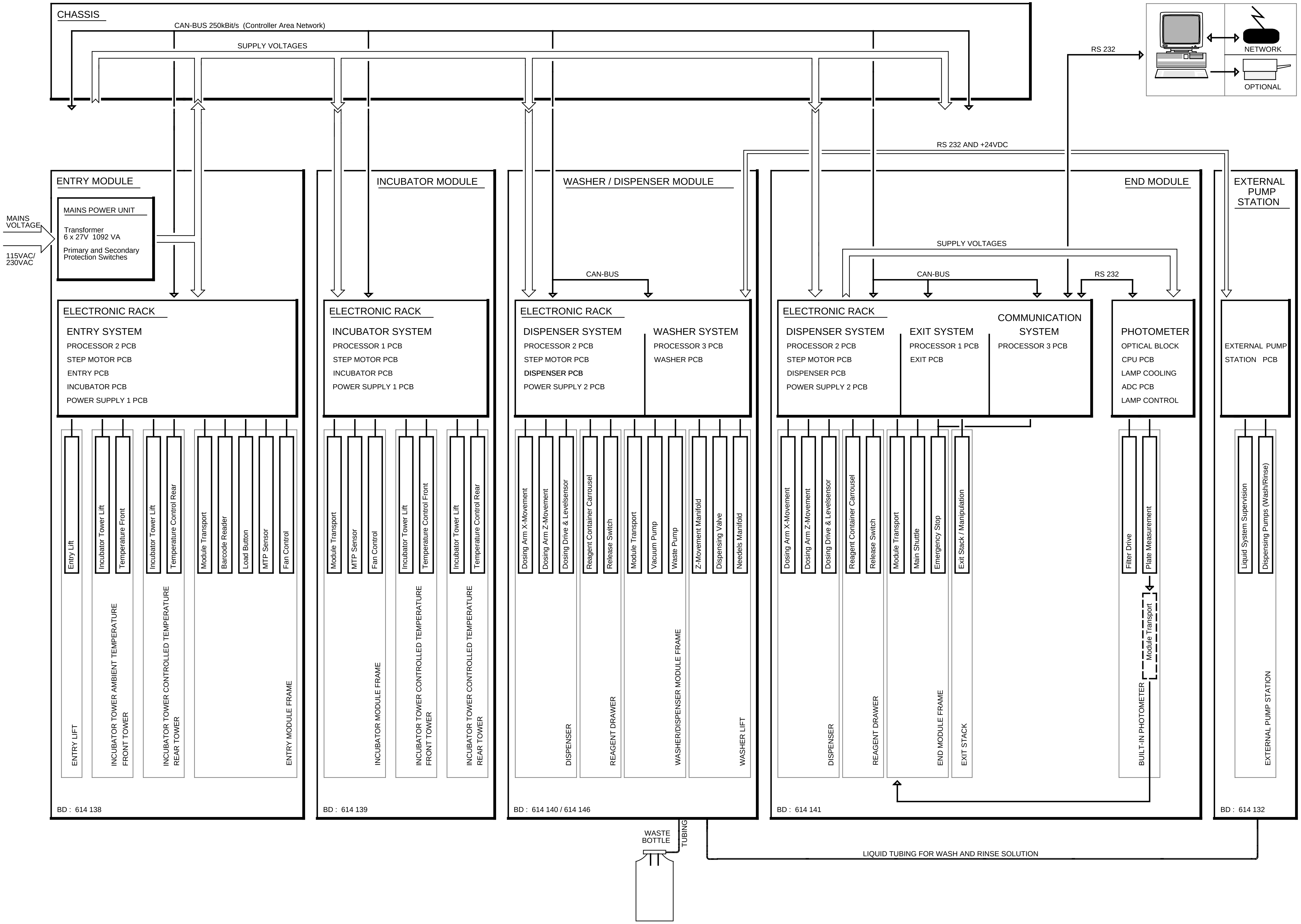
Error Code	Error type/description	Detectors	Criteria	Remarks
16	Flash EPROM not programmable	download functions	programming error	unsafe function
18	RAM checksum error	RAM check	checksum incorrect	unsafe function
22	undefined parameter	syntax check	syntax error	unknown parameter
26	system not initialized	function (init) status	status error	no initialization carried out administration in undefined condition
42	module transport step lost	step control		step loss during measurement
44	no plate detected			plate edge not detected
81	reference channel error			reference channel is instable during measurement
82	no measurement data stored			no measurement carried out
83	wrong address access			

Error Code	Error type/description	Detectors	Criteria	Remarks
85	bus error			wrong address
86	unexpected interrupt			
87	ADC too slow			error during data request of ADC
88	operating system not found			operating system not found during check by checksum of operating program, or operating program is incorrect
89	calculation error			e.g. division by zero
90	incomplete measurement			interrupt, data lost
91	calibration minimum out of range			incorrect measurement
92	calibration maximum out of range			incorrect measurement
94	filter transport blocked			incorrect measurement
95	I/O error			characters missing, incorrect transmission
96	filter transport not initialized			measurement impossible
97	plate in wrong position			undefined position of module transport
98	module transport out of angle			undefined position of module transport
99	module transport in wrong position		± >1 mm	module transport was in wrong position for hand over

Container Stack Raw

147 549

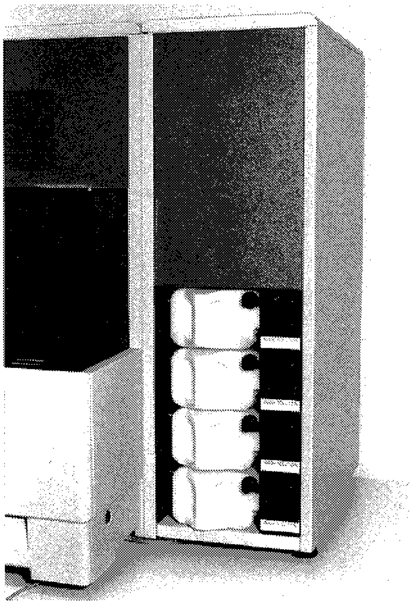
- Block Diagram Instrument
- Container Stack Raw
- 3D Drawing


CHASSIS
CAN-BUS 250kBit/s (Controller Area Network)
SUPPLY VOLTAGES
RS 232
NETWORK
OPTIONAL
RS 232 AND +24VDC
ENTRY MODULE
MAINS VOLTAGE
115VAC/ 230VAC
MAINS POWER UNIT
Transformer 6 x 27V 1092 VA
Primary and Secondary Protection Switches
ELECTRONIC RACK
ENTRY SYSTEM
PROCESSOR 2 PCB
STEP MOTOR PCB
ENTRY PCB
INCUBATOR PCB
POWER SUPPLY 1 PCB
Entry Lift
Incubator Tower Lift
Temperature Front
Incubator Tower Lift
Temperature Control Rear
Module Transport
Barcode Reader
Load Button
MTP Sensor
Fan Control
ENTRY LIFT
INCUBATOR TOWER AMBIENT TEMPERATURE FRONT TOWER
INCUBATOR TOWER CONTROLLED TEMPERATURE REAR TOWER
ENTRY MODULE FRAME
BD : 614 138
INCUBATOR MODULE
ELECTRONIC RACK
INCUBATOR SYSTEM
PROCESSOR 1 PCB
STEP MOTOR PCB
INCUBATOR PCB
POWER SUPPLY 1 PCB
Module Transport
MTP Sensor
Fan Control
Incubator Tower Lift
Temperature Control Front
Incubator Tower Lift
Temperature Control Rear
INCUBATOR MODULE FRAME
INCUBATOR TOWER CONTROLLED TEMPERATURE FRONT TOWER
INCUBATOR TOWER CONTROLLED TEMPERATURE REAR TOWER
BD : 614 139
WASHER / DISPENSER MODULE
CAN-BUS
ELECTRONIC RACK
DISPENSER SYSTEM
PROCESSOR 2 PCB
STEP MOTOR PCB
DISPENSER PCB
POWER SUPPLY 2 PCB
WASHER SYSTEM
PROCESSOR 3 PCB
WASHER PCB
Dosing Arm X-Movement
Dosing Arm Z-Movement
Dosing Drive & Levelsensor
Reagent Container Carrousel
Release Switch
Module Transport
Vacuum Pump
Waste Pump
Z-Movement Manifold
Dispensing Valve
Needels Manifold
DISPENSER
REAGENT DRAWER
WASHER/DISPENSER MODULE FRAME
WASHER LIFT
BD : 614 140 / 614 146
WASTE BOTTLE
TUBING
END MODULE
SUPPLY VOLTAGES
CAN-BUS
RS 232
ELECTRONIC RACK
DISPENSER SYSTEM
PROCESSOR 2 PCB
STEP MOTOR PCB
DISPENSER PCB
POWER SUPPLY 2 PCB
EXIT SYSTEM
PROCESSOR 1 PCB
EXIT PCB
COMMUNICATION SYSTEM
PROCESSOR 3 PCB
PHOTOMETER
OPTICAL BLOCK
CPU PCB
LAMP COOLING
ADC PCB
LAMP CONTROL
Dosing Arm X-Movement
Dosing Arm Z-Movement
Dosing Drive & Levelsensor
Reagent Container Carrousel
Release Switch
Module Transport
Main Shuttle
Emergency Stop
Exit Stack / Manipulation
Filter Drive
Plate Measurement
Module Transport
DISPENSER
REAGENT DRAWER
END MODULE FRAME
EXIT STACK
BUILT-IN PHOTOMETER
BD : 614 141
EXTERNAL PUMP STATION
EXTERNAL PUMP STATION PCB
Liquid System Supervision
Dispensing Pumps (Wash/Rinse)
EXTERNAL PUMP STATION
BD : 614 132
LIQUID TUBING FOR WASH AND RINSE SOLUTION

Block Diagram Instrument Microlab F.A.M.E. 16/20

614.137 revision 00

6.2 Container Stack



6.2.1 Functional Description Container Stack

The Container Stack houses the external pump station, wash solution and rinse solution containers, and tools. All containers (3 wash-solution containers and 1 rinse-solution container) hold up to 3 liters of solution and are liquid level controlled.

6.2.2 Removing Container Stack

See section 1.1.5.3.1.

(Installing Container Stack see section 1.1.4.3.6).

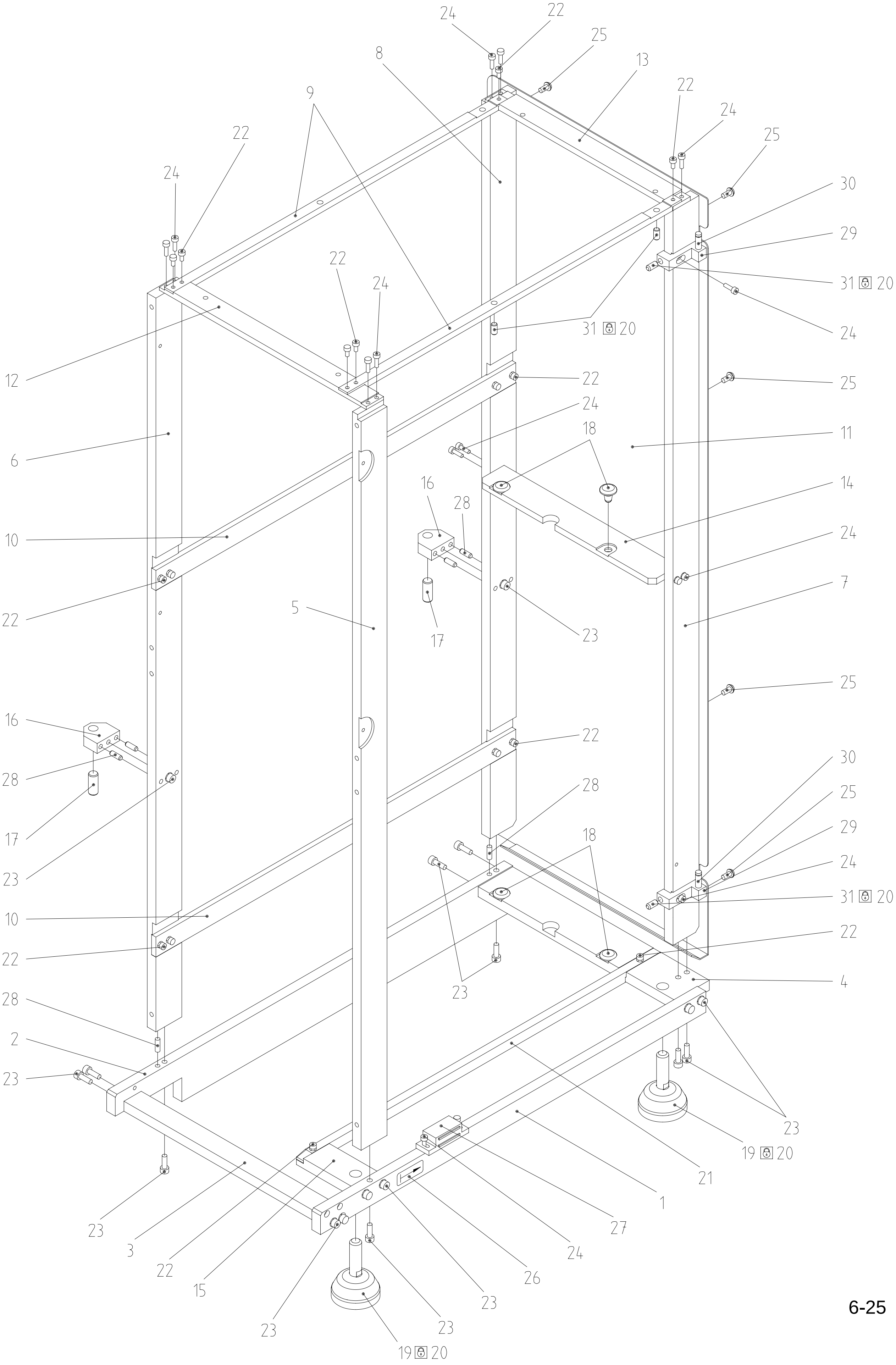
(External Pump Station see section 4.6)

6.2.3 Spare Parts List

CONTAINER STACK RAW 147549 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147550	LAENGSTRAEGER	00	1	1.000	
147551	BASISTRAEGER	00	2	1.000	
147552	QUERTRAEGER	00	3	1.000	
147553	TRAEGER UNTEN	00	4	1.000	
147554	HOCHSTREBE VORNE	00	5	1.000	
147555	STIFTSTREBE VORNE	00	6	1.000	
147556	HOCHSTREBE HINTEN	00	7	1.000	
147557	STIFTSTREBE HINTEN	00	8	1.000	
147558	LAENGSTRAEGER OBEN	00	9	2.000	
147559	FUEHRUNGSTRAEGER	00	10	2.000	
147560	RUECKWANDBLECH	00	11	1.000	
147561	QUERTRAEGER VORNE	00	12	1.000	
147562	QUERTRAEGER HINTEN	00	13	1.000	
147563	TRAEGER OBEN	00	14	1.000	
147564	FUSSTRAEGER	00	15	1.000	
147565	STIFTTRAEGER	00	16	2.000	
251715	ZYL-STIFT 8 X20 DIN6325	00	17	2.000	
279386	DRUCKKNOPFPUFFER NK SCHWARZ	00	18	4.000	
281111	GERAETEFUSS M10	00	19	2.000	B
511006	LOCTITE 222 50mL	00	20	0.000	T
147566	FUEHRUNG	00	21	1.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	22	16.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	23	17.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	24	18.000	
420322	LINSENSCHR. M4X8 ISO7380	00	25	8.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	26	1.000	
279390	MAGNETSCHNAEPPER 15X46X13,5MM	00	27	1.000	C
251124	ZYL-STIFT 4 X12 DIN6325	00	28	6.000	
148151	TUERANGEL	00	29	2.000	
147793	BOLZEN	00	30	2.000	
405085	GEW.STIFT VERZ M 5X10 DIN913	00	31	4.000	

6.2.4 3D Drawing Container Stack Raw: Dwg. 147 549 revision 00

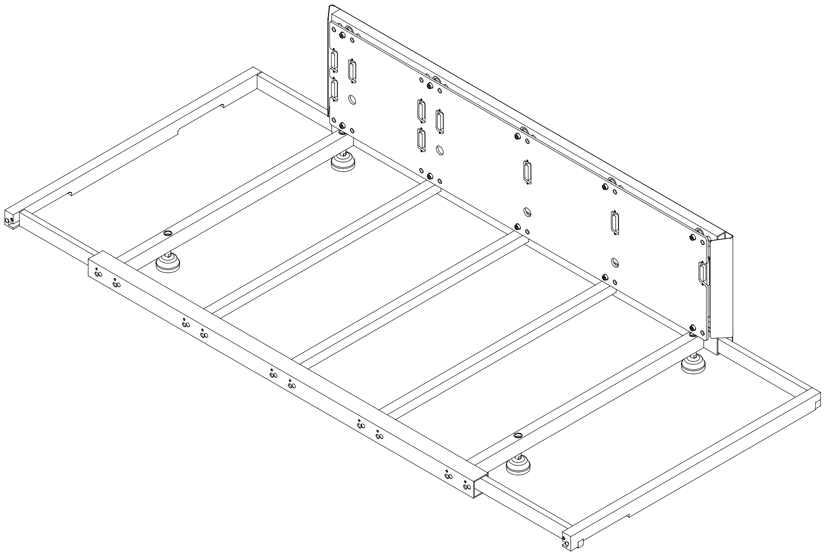

24
22
25
8
13
22
24
25
9
22
24
30
29
31 🔒 20
22
24
24
31 🔒 20
12
22
25
24
18
11
6
16
28
14
24
10
7
22
5
23
17
25
16
22
28
30
28
25
17
18
29
23
24
31 🔒 20
10
22
22
28
4
2
23
23
23
19 🔒 20
21
1
23
3
27
22
24
15
26
23
23
23
19 🔒 20

Chassis

147 150

- Connector Boards
  - Motherboard 1 146 150
  - Motherboard 2 146 152
- Adjusting Chassis
- Wiring Diagrams
- Replacing Spare Parts
- Spare Parts List

6.3 Chassis



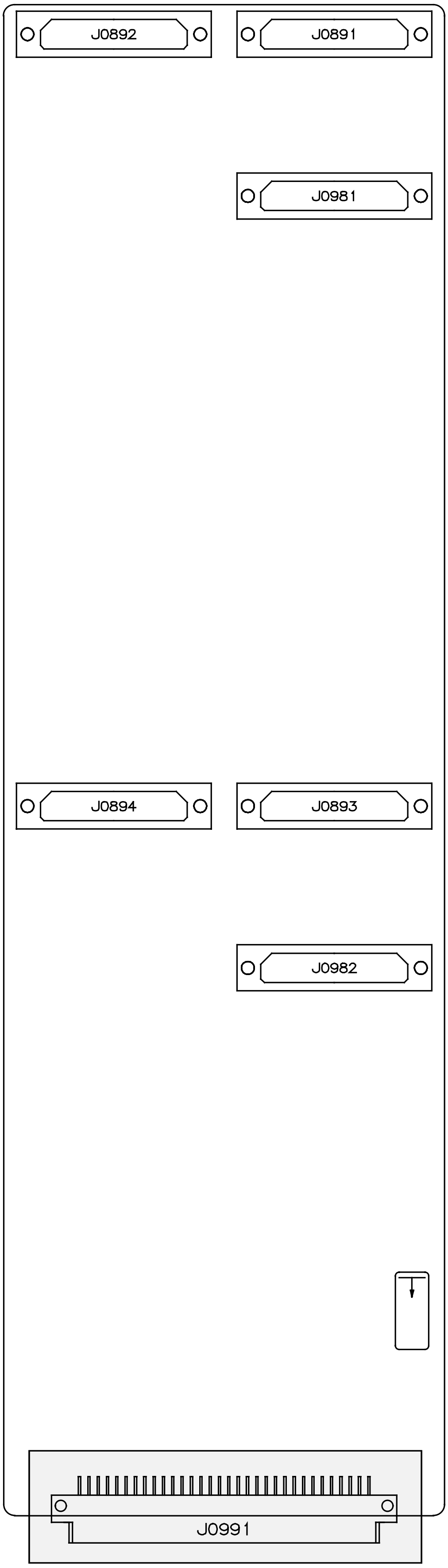
6.3.1 Connector Boards

Motherboard 1 Chassis PCB & Motherboard 2 Chassis PCB (component layouts): see next page.

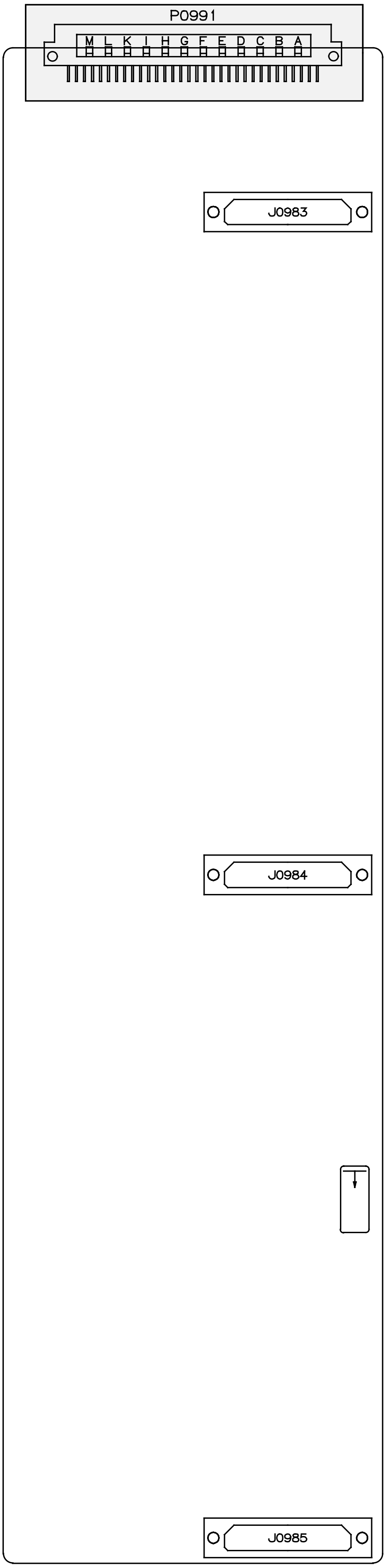
6.3.2 Adjusting Chassis

See section 1.1.4.2.

Motherboard 1 Chassis PCB (component layout): 146 150 revision 00

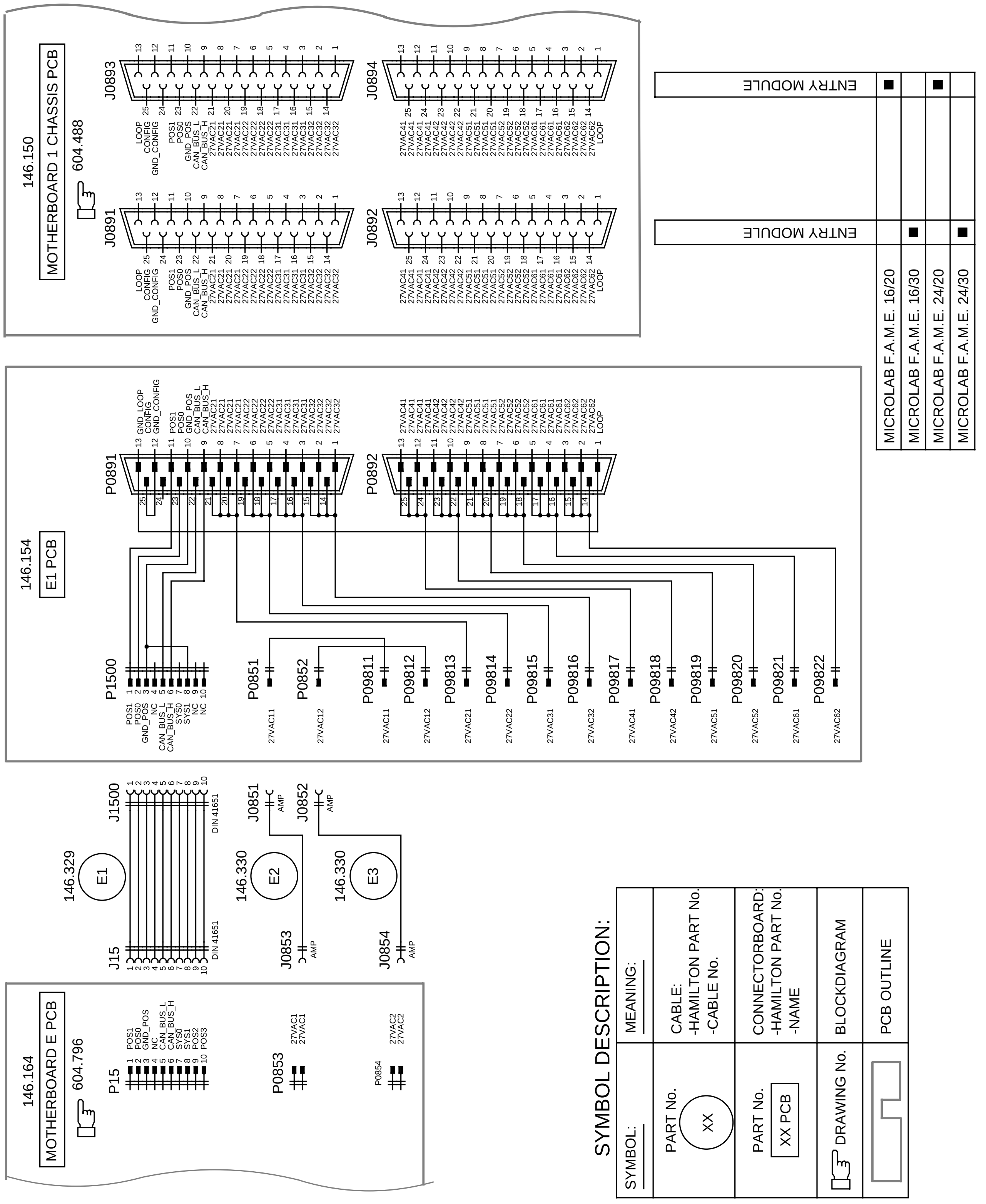

J0892
J0891
J0981
J0894
J0893
J0982
J0991

Motherboard 2 Chassis PCB (component layout): 146 152 revision 00


P0991
M L K I H G F E D C B A
J0983
J0984
J0985

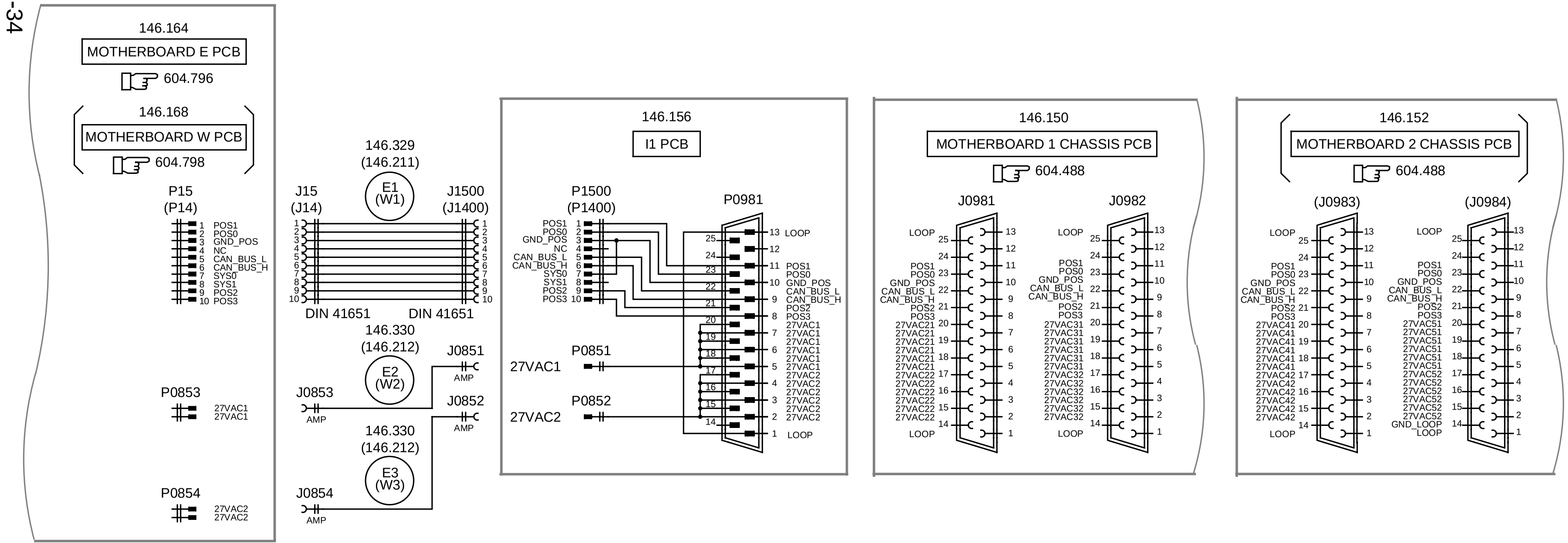
6.3.3 Wiring Diagrams

Entry Module Connection: Dwg No. 616 006 revision 00


146.150
MOTHERBOARD 1 CHASSIS PCB
604.488
J0893
J0894
J0891
J0892
ENTRY MODULE
ENTRY MODULE
MICROLAB F.A.M.E. 16/20
MICROLAB F.A.M.E. 16/30
MICROLAB F.A.M.E. 24/20
MICROLAB F.A.M.E. 24/30
146.154
E1 PCB
P0891
P0892
P1500
P0851
P0852
P09811
P09812
P09813
P09814
P09815
P09816
P09817
P09818
P09819
P09820
P09821
P09822
27VAC11
27VAC12
27VAC11
27VAC12
27VAC21
27VAC22
27VAC31
27VAC32
27VAC41
27VAC42
27VAC51
27VAC52
27VAC61
27VAC62
POS1
POS0
GND_POS
NC
CAN_BUS_L
CAN_BUS_H
SYS0
SYS1
NC
NC
GND_LOOP
CONFIG
GND_CONFIG
LOOP
146.329
E1
J1500
J15
DIN 41651
146.330
E2
J0851
J0853
146.330
E3
J0852
J0854
AMP
146.164
MOTHERBOARD E PCB
604.796
P15
POS2
POS3
P0853
27VAC1
P0854
27VAC2
SYMBOL DESCRIPTION:
SYMBOL:
MEANING:
PART No.
XX
CABLE:
-HAMILTON PART No.
-CABLE No.
PART No.
XX PCB
CONNECTORBOARD:
-HAMILTON PART No.
-NAME
DRAWING No.
BLOCKDIAGRAM
PCB OUTLINE

Incubator & Washer/Dispenser Module Connection:

Dwg No. 616 007 revision 00


146.164
MOTHERBOARD E PCB
604.796
146.168
MOTHERBOARD W PCB
604.798
P15
(P14)
1 POS1
2 POS0
3 GND_POS
4 NC
5 CAN_BUS_L
6 CAN_BUS_H
7 SYS0
8 SYS1
9 POS2
10 POS3
P0853
27VAC1
27VAC1
P0854
27VAC2
27VAC2
J15
(J14)
146.329
(146.211)
E1
(W1)
J1500
(J1400)
DIN 41651
DIN 41651
146.330
(146.212)
E2
(W2)
J0851
AMP
J0853
AMP
J0852
AMP
146.330
(146.212)
E3
(W3)
J0854
AMP
146.156
I1 PCB
P1500
(P1400)
P0981
P0851
27VAC1
P0852
27VAC2
LOOP
146.150
MOTHERBOARD 1 CHASSIS PCB
604.488
J0981
J0982
27VAC21
27VAC22
27VAC31
27VAC32
146.152
MOTHERBOARD 2 CHASSIS PCB
604.488
(J0983)
(J0984)
27VAC41
27VAC42
27VAC51
27VAC52
GND_LOOP

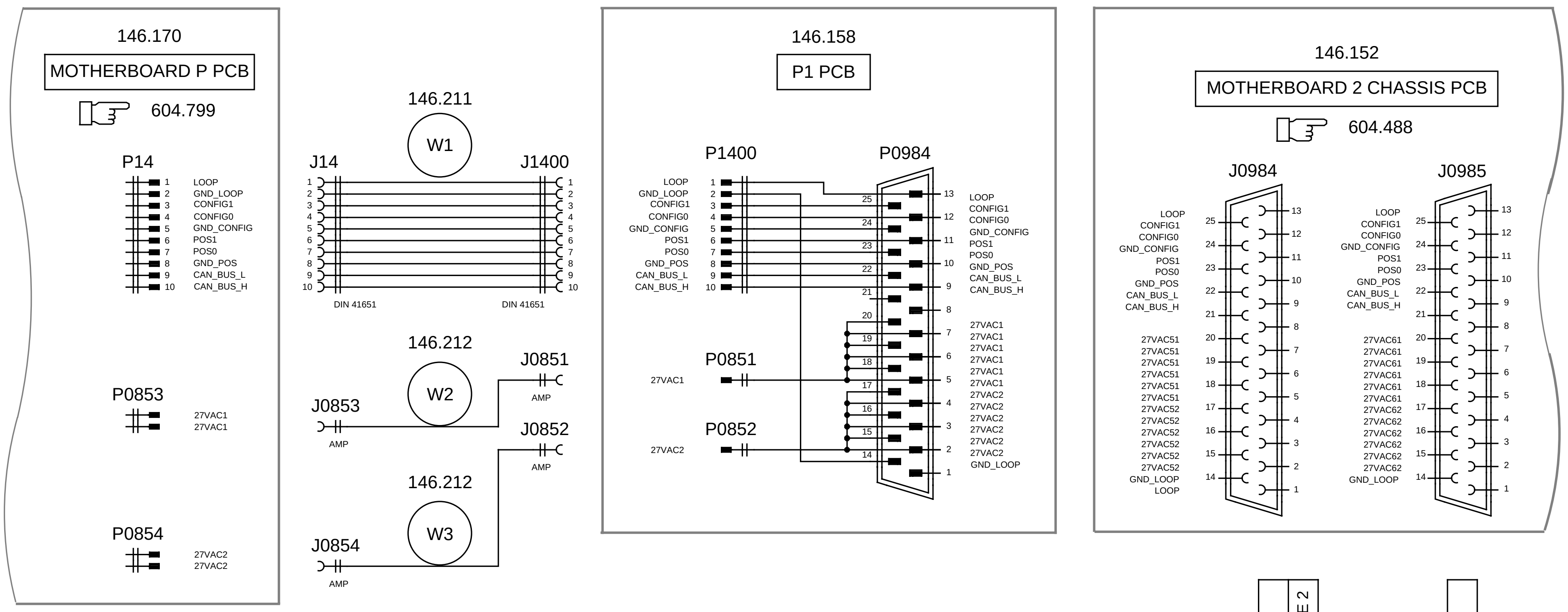
	INCUBATOR MODULE 1	INCUBATOR MODULE	INCUBATOR MODULE 2	WASHER/DISPENSER MODULE	WASHER/DISPENSER MODULE 1	PHOTOMETER/END MODULE	WASHER/DISPENSER MODULE 2
MICROLAB F.A.M.E. 16/20		■		■		■	
MICROLAB F.A.M.E. 16/30	■		■	■		■	
MICROLAB F.A.M.E. 24/20		■			■		■
MICROLAB F.A.M.E. 24/30	■		■		■		■

SYMBOL DESCRIPTION:

SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
☞ DRAWING No.	BLOCKDIAGRAM
	PCB OUTLINE

Photometer / End Module Connection:

Dwg No. 616 008 revision 00


146.170
MOTHERBOARD P PCB
604.799
P14
1 LOOP
2 GND_LOOP
3 CONFIG1
4 CONFIG0
5 GND_CONFIG
6 POS1
7 POS0
8 GND_POS
9 CAN_BUS_L
10 CAN_BUS_H
P0853
27VAC1
27VAC1
P0854
27VAC2
27VAC2
146.211
W1
J14
J1400
DIN 41651
DIN 41651
146.212
W2
J0853
AMP
J0851
AMP
J0852
AMP
146.212
W3
J0854
AMP
146.158
P1 PCB
P1400
P0984
P0851
27VAC1
P0852
27VAC2
146.152
MOTHERBOARD 2 CHASSIS PCB
604.488
J0984
J0985
27VAC51
27VAC52
27VAC61
27VAC62
GND_LOOP
LOOP

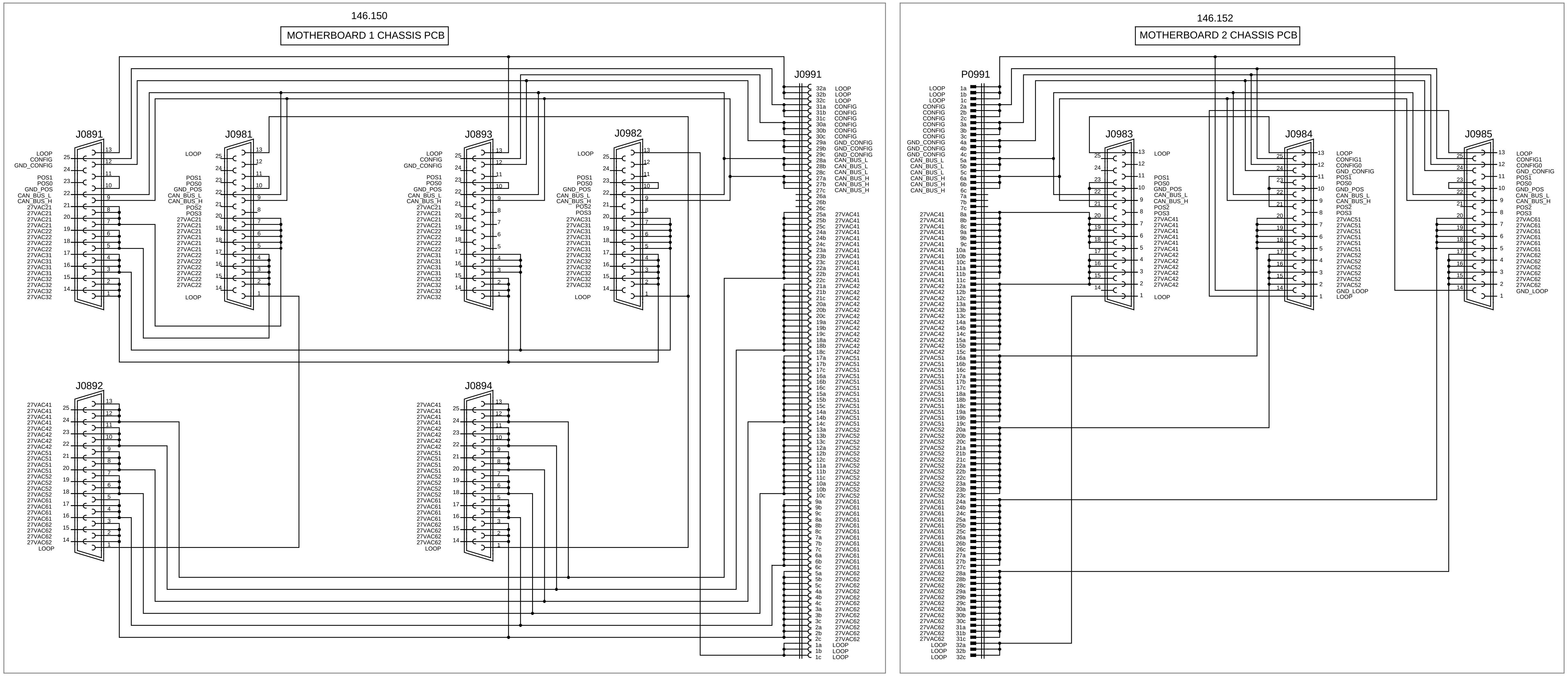
SYMBOL DESCRIPTION:

SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
DRAWING No.	BLOCKDIAGRAM
	PCB OUTLINE

	PHOTOMETER/END MODULE	WASHER/DISPENSER MODULE 2		PHOTOMETER/END MODULE
MICROLAB F.A.M.E. 16/20	■			
MICROLAB F.A.M.E. 16/30	■			
MICROLAB F.A.M.E. 24/20		■		■
MICROLAB F.A.M.E. 24/30		■		■

Refer to the drawing on the following page:

Chassis: Dwg No. 604 488



Wiring Diagram Chassis 604.488 revision 00

- - -	- - -	ENTRY MODULE	INCUBATOR MODULE	MICROLAB F.A.M.E. 16/20	WASHER/DISPENSER MODULE	PHOTOMETER/END MODULE	- - -
ENTRY MODULE	INCUBATOR MODULE 1	- - -	INCUBATOR MODULE 2	MICROLAB F.A.M.E. 16/30	WASHER/DISPENSER MODULE	PHOTOMETER/END MODULE	- - -
- - -	- - -	ENTRY MODULE	INCUBATOR MODULE	MICROLAB F.A.M.E. 24/20	WASHER/DISPENSER MODULE 1	WASHER/DISPENSER MODULE 2	PHOTOMETER/END MODULE
ENTRY MODULE	INCUBATOR MODULE 1	- - -	INCUBATOR MODULE 2	MICROLAB F.A.M.E. 24/30	WASHER/DISPENSER MODULE 1	WASHER/DISPENSER MODULE 2	PHOTOMETER/END MODULE

SYMBOL DESCRIPTION:

SYMBOL:	MEANING:
PART No. XX	CABLE: -HAMILTON PART No. -CABLE No.
PART No. XX PCB	CONNECTORBOARD: -HAMILTON PART No. -NAME
☞ DRAWING No.	BLOCKDIAGRAM
⎍	PCB OUTLINE

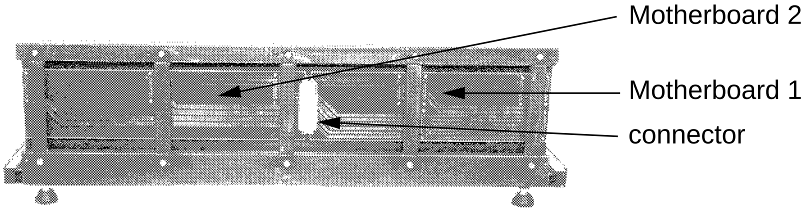
Comments

- Four, five, or six modules may be installed. The end module recognizes these configurations:
- Each module recognizes its own position via 10/11/23.
- The end module recogizes the position of the entry module via 12/24/25 (for J0891/93 it is 12/25).
- Each module closes the control loop via pin 1/13 (Randpins). The end module recognizes that all modules are correctly connected.
- Each module (except the entry module) is supplied with 27VAC over the pin group 2/3/4/15/16/17 and 5/6/7/18/19/20.
- Communication takes place via a 2-wire-line CAN_BUS_L and CAN_BUS_H.
- The incubator and washer/disp. modules have a link between pin 1 and pin 13.
- The entry module has a link between P0892/1 and P0891/13, and P0891/12 and P0891/25.

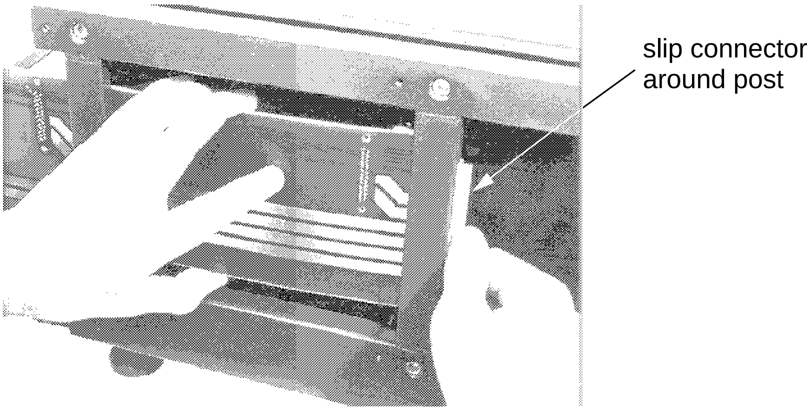
6.3.4 Replacing Spare Parts

6.3.4.1 Removing / Replacing Motherboard 1 item 9 and Motherboard 2 item 13

Remove the 10 screws fastening the chassis panel (item 8).


Motherboard 2
Motherboard 1
connector

Remove motherboard 2 (item 13) by carefully bending it around the chassis posts.


slip connector
around post

6.3.5 Spare Parts List

CHASSIS 147150 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147151	SCHWEISSKONSTRUKTION CHASSIS	00	1	1.000	
147155	AUSZIEHBUEGEL ENTRY	00	2	1.000	
147156	AUSZUGSCHIENE	00	3	4.000	
147157	KORREKTURBUECHSE	00	4	10.000	
147160	POSITIONIERPLATTE	00	7	1.000	
147161	RUECKWANDBLECH	00	8	1.000	
146150	CHASSIS MOTHERBOARD 1 PCB	00	9	1.000	C
400345	ZYL-SCHR.M 5X16 DIN912 A2	00	10	10.000	
420528	GEW.STIFT DACR M12X10 DIN 913	00	11	10.000	
420532	ZYL.-SCHRAUBE M4x6 I-6KT	00	12	12.000	
146152	CHASSIS MOTHERBOARD 2 PCB	00	13	1.000	C
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	14	16.000	
420322	LINSENSCHR. M4X8 ISO7380	00	15	10.000	
400265	ZYL-SCHR.M 3X12 DIN912 A2	00	16	18.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	17	1.000	
281111	GERAETEFUSS M10	00	18	4.000	B
147169	AUSZIEHBUEGEL END	00	20	1.000	
511006	LOCTITE 222 50mL	00	21	0.000	T
511010	LOCTITE 638 50mL	00	22	0.000	T

Main Shuttle Rail

Small	Medium	Large
147 596	147 601	147 610

- Functional Description
- Removing / Replacing Main Shuttle Rail & Spare Parts
- Spare Parts Lists
  - Small 147 596
  - Medium 147 601
  - Large 147 610
- 3D Drawing

6.4 Main Shuttle Rail

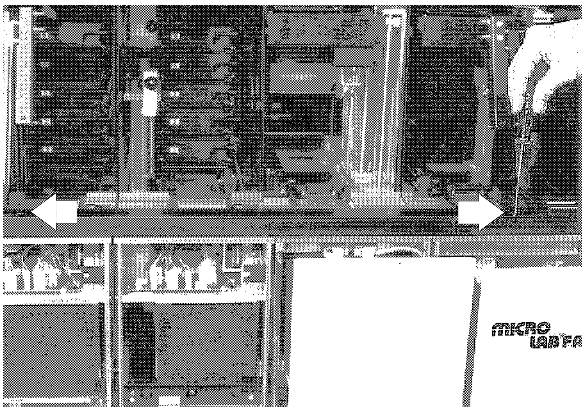
ML F.A.M.E. Configuration	Main Shuttle Rail	P/N
16/20	Small	147 596
16/30, 24/20	Medium	147 601
24/30	Large	147 610

6.4.1 Functional Description

The main shuttle rail transports MTPs between modules.

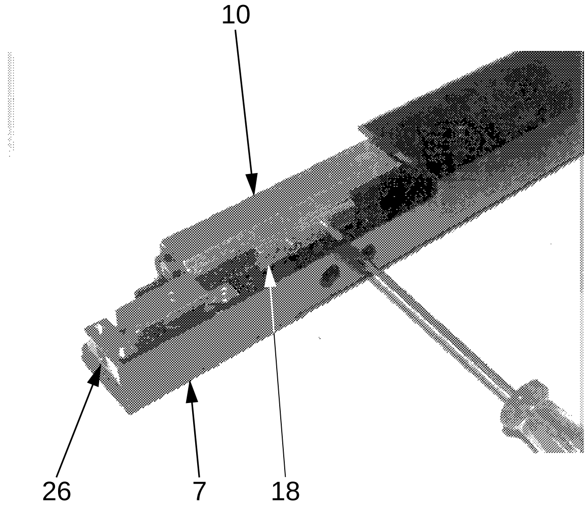
6.4.2 Removing / Replacing Main Shuttle Rail & Spare Parts

Remove the two screws fastening the main shuttle rail to the instrument.



Gear belt item 19

Move the *support (item 10*) to the left until the two belt clamp screws are accessible through the two holes in the *rail (item 7*).



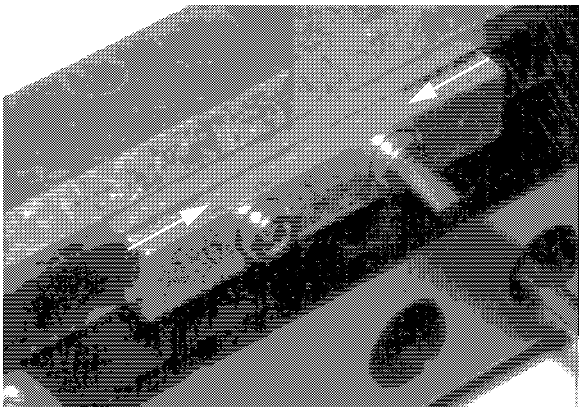
Slacken the belt by loosening screw item 26.

Unscrew and remove *belt clamp item 18* (two screws item 25).

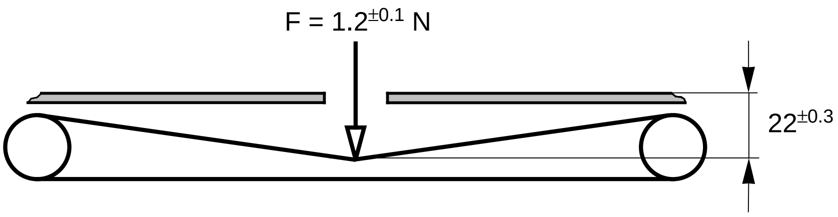
Remounting Gear Belt:

Be sure the belt is not twisted!

Clamp as much of the belt ends as possible.



Belt tension:



6.4.3 Spare Parts List

MAIN SHUTTLE RAIL (SMALL) 147 596 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147600	LAGERBLOCK	00	1	1.000	
147615	HUELSE	00	2	1.000	
147599	ACHSE	00	3	1.000	
147597	ZAHNRAD Z=18 M=1.5	00	4	1.000	
147598	RIEMENRITZEL Z=25 T=0.08”	00	5	1.000	
147603	FUEHRUNGSWELLE KURZ	01	6	1.000	
147602	RAIL KURZ	00	7	1.000	
147606	WELLENSTUETZE	00	8	5.000	
147614	FLANSCHSCHEIBE	00	9	2.000	
147607	SUPPORT	00	10	1.000	
147608	LAGER M. SCHLITZ	00	11	2.000	
147605	WELLENSCHEIBE	01	12	2.000	
147613	SPANNBLOCK	00	13	1.000	
147611	ROLLENGABEL	00	14	1.000	
147612	ROLLE	00	15	1.000	
148158	RAIL-HALTER	00	16	2.000	
148159	LAGERWELLE	00	17	1.000	
147609	RIEMENKLEMME	00	18	1.000	
258059	ZAHNRIEMEN Z=897 X1/4”	00	19	1.000	C
250029	K.LAGER ID=3 AD=10 B=4	00	20	1.000	
279279	SINTERBZ.LAGER 5E7/10R7/12 4+2	00	22	2.000	
252070	SCHWERSPANNSTIFT D=2 L=20	00	23	1.000	
251032	ZYL-STIFT 2,0X 8 DIN6325	00	24	5.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	25	3.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	26	2.000	
400268	ZYL-SCHR.M 3X18 DIN912 A2	00	27	1.000	
420311	SENKSCHRAUBE M 4X10 DIN7991	00	28	8.000	
511010	LOCTITE 638 50mL	00	29	0.000	T
511006	LOCTITE 222 50mL	00	30	0.000	T
255037	KENNZEICHNUNGS LABEL 30 X 12	00	31	1.000	
420067	SENKSCHRAUBE M 4X12 DIN7991	00	32	5.000	

MAIN SHUTTLE RAIL (MEDIUM) 147 601 Revision: 00

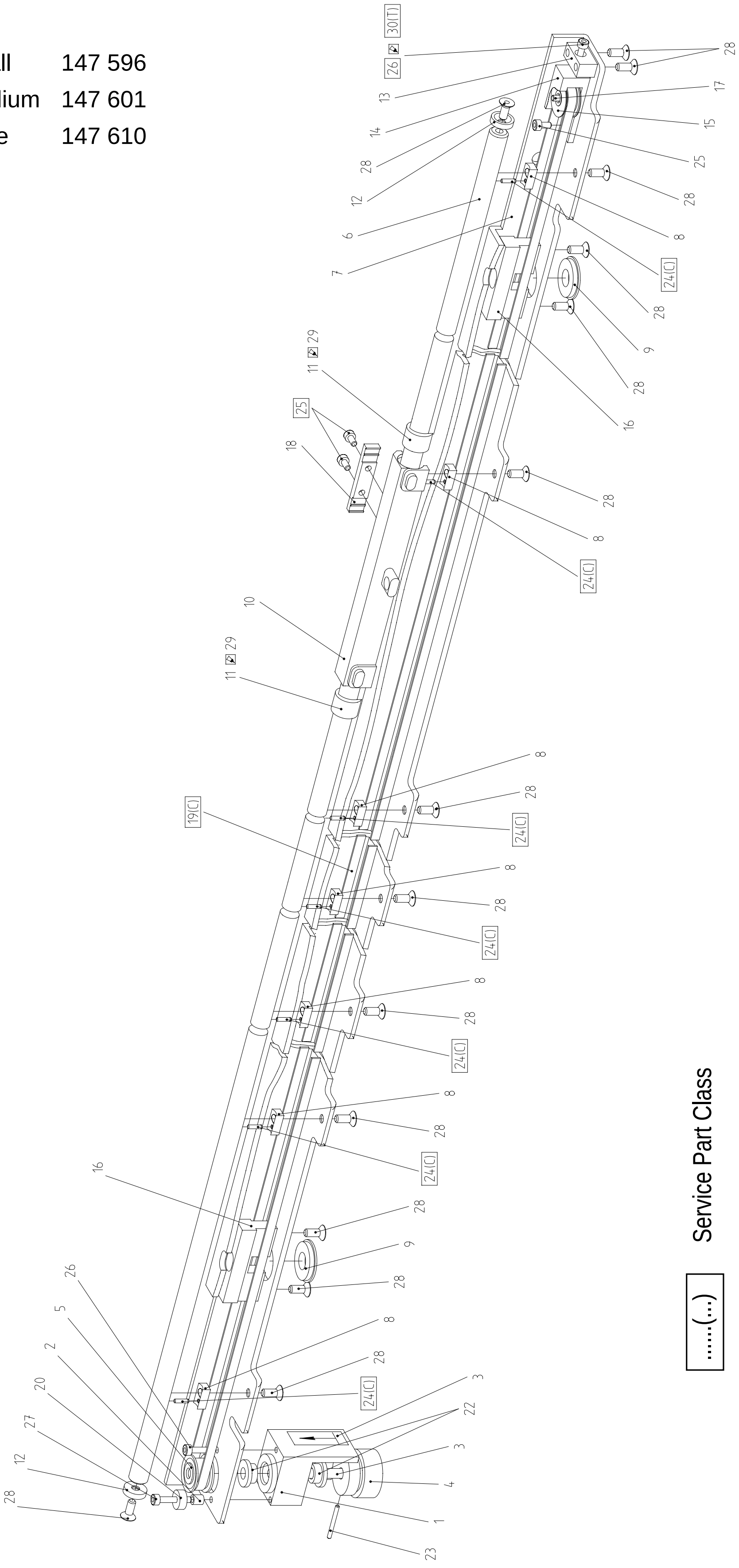
P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147600	LAGERBLOCK	00	1	1.000	
147615	HUELSE	00	2	1.000	
147599	ACHSE	00	3	1.000	
147597	ZAHNRAD Z=18 M=1.5	00	4	1.000	
147598	RIEMENRITZEL Z=25 T=0.08”	00	5	1.000	
147619	FUEHRUNGSWELLE MITTEL	01	6	1.000	
147617	RAIL MITTEL	00	7	1.000	
147606	WELLENSTUETZE	00	8	6.000	
147614	FLANSCHSCHEIBE	00	9	2.000	
147607	SUPPORT	00	10	1.000	
147608	LAGER M. SCHLITZ	00	11	2.000	
147605	WELLENSCHEIBE	01	12	2.000	
147613	SPANNBLOCK	00	13	1.000	
147611	ROLLENGABEL	00	14	1.000	
147612	ROLLE	00	15	1.000	
148158	RAIL-HALTER	00	16	2.000	
148159	LAGERWELLE	00	17	1.000	
147609	RIEMENKLEMME	00	18	1.000	
258060	ZAHNRIEMEN Z=1104 X 1/4”	00	19	1.000	C
250029	K.LAGER ID=3 AD=10 B=4	00	20	1.000	
279279	SINTERBZ.LAGER 5E7/10R7/12 4+2	00	22	2.000	
252070	SCHWERSPANNSTIFT D=2 L=20	00	23	1.000	
251032	ZYL-STIFT 2,0X 8 DIN6325	00	24	6.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	25	3.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	26	2.000	
400268	ZYL-SCHR.M 3X18 DIN912 A2	00	27	1.000	
420311	SENKSCHRAUBE M 4X10 DIN7991	00	28	8.000	
511010	LOCTITE 638 50mL	00	29	0.000	T
511006	LOCTITE 222 50mL	00	30	0.000	T
255037	KENNZEICHNUNGS LABEL 30 X 12	00	31	1.000	
420067	SENKSCHRAUBE M 4X12 DIN7991	00	32	6.000	

MAIN SHUTTLE RAIL (LARGE) 147 610 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
147600	LAGERBLOCK	00	1	1.000	
147615	HUELSE	00	2	1.000	
147599	ACHSE	00	3	1.000	
147597	ZAHNRAD Z=18 M=1.5	00	4	1.000	
147598	RIEMENRITZEL Z=25 T=0.08”	00	5	1.000	
147620	FUEHRUNGSWELLE LANG	01	6	1.000	
147618	RAIL LANG	00	7	1.000	
147606	WELLENSTUETZE	00	8	7.000	
147614	FLANSCHSCHEIBE	00	9	2.000	
147607	SUPPORT	00	10	1.000	
147608	LAGER M. SCHLITZ	00	11	2.000	
147605	WELLENSCHEIBE	01	12	2.000	
147613	SPANNBLOCK	00	13	1.000	
147611	ROLLENGABEL	00	14	1.000	
147612	ROLLE	00	15	1.000	
148158	RAIL-HALTER	00	16	2.000	
148159	LAGERWELLE	00	17	1.000	
147609	RIEMENKLEMME	00	18	1.000	
258061	ZAHNRIEMEN Z=1311 X1/4”	00	19	1.000	C
250029	K.LAGER ID=3 AD=10 B=4	00	20	1.000	
279279	SINTERBZ.LAGER 5E7/10R7/12 4+2	00	22	2.000	
252070	SCHWERSPANNSTIFT D=2 L=20	00	23	1.000	
251032	ZYL-STIFT 2,0X 8 DIN6325	00	24	7.000	C
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	25	3.000	
400264	ZYL-SCHR.M 3X10 DIN912 A2	00	26	2.000	
400268	ZYL-SCHR.M 3X18 DIN912 A2	00	27	1.000	
420311	SENKSCHRAUBE M 4X10 DIN7991	00	28	8.000	
511010	LOCTITE 638 50mL	00	29	0.000	T
511006	LOCTITE 222 50mL	00	30	0.000	T
255037	KENNZEICHNUNGS LABEL 30 X 12	00	31	1.000	
420067	SENKSCHRAUBE M 4X12 DIN7991	00	32	7.000	

6.4.4 3D Drawing Main Shuttle Rail: Dwg. revision 00

small	147 596
medium	147 601
large	147 610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24(C)
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23

Service Part Class

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Transparent Cover

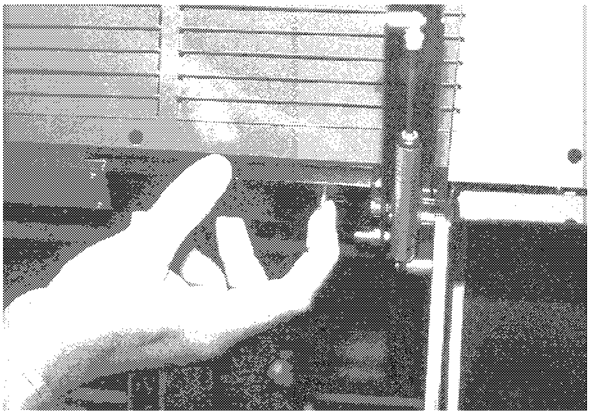
Small	Medium	Large
147 920	147 921	147 922

- Removing Transparent Cover
- Spare Parts Lists
  - Small 147 920
  - Medium 147 921
  - Large 147 922
- 3D Drawing

6.5 Transparent Cover

6.5.1 Removing Transparent Cover

Lift the transparent cover, press in the two visible locking pins, and remove the transparent cover.



6.5.2 Spare Parts List

TRANSPARENT COVER (SMALL, for 16 / 20) 147920 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
148152	SCHUTZGLAS KURZ LACK.	00	1	1.000	
147951	QUERSTREBE LINKS	00	2	1.000	
147952	QUERSTREBE RECHTS	00	3	1.000	
147950	HANDGRIFF	00	4	1.000	
147954	ARRETIERBOLZEN	00	5	2.000	C
147955	GRIFF FUER ARRETIERUNGSBOLZEN	00	6	2.000	C
256120	DRUCKFEDER ROSTFREI 0.4MM	00	7	2.000	C
403493	SENKSCHRAUBE M 4X12 DIN7991	00	8	2.000	
7281118	KLEBSTOFF-FILM ISOTAC	00	9	0.640	
511006	LOCTITE 222 50mL	00	10	0.000	T
281115	SCHEIBENMAGNET 5X2 MM	00	11	1.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	12	4.000	
148251	VERSTEIFUNGSSTREBE KURZ	00	13	1.000	
511021	ARALDIT HARZ AW 106	00	14	0.000	
511022	ARALDIT HAERTER HV 953 U	00	15	0.000	
255038	KENNZEICHNUNG LABEL 21X9 WEISS	00	16	1.000	
255042	WARNZ. BIOGEFAEHRDUNG	00	17	1.000	
255618	WARNZ. BEWEGTE TEILE	00	18	1.000	

TRANSPARENT COVER (MEDIUM, for 16 / 30 and 24 / 20) 147921

Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
148153	SCHUTZGLAS MITTEL LACK.	00	1	1.000	
147951	QUERSTREBE LINKS	00	2	1.000	
147952	QUERSTREBE RECHTS	00	3	1.000	
147950	HANDGRIFF	00	4	1.000	
147954	ARRETIERBOLZEN	00	5	2.000	C
147955	GRIFF FUER ARRETIERUNGSBOLZEN	00	6	2.000	C
256120	DRUCKFEDER ROSTFREI 0.4MM	00	7	2.000	C
403493	SENKSCHRAUBE M 4X12 DIN7991	00	8	2.000	
7281118	KLEBSTOFF-FILM ISOTAC	00	9	0.850	
511006	LOCTITE 222 50mL	00	10	0.000	T
281115	SCHEIBENMAGNET 5X2 MM	00	11	1.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	12	4.000	
148237	VERSTEIFUNGSSTREBE MITTEL	00	13	1.000	
511021	ARALDIT HARZ AW 106	00	14	0.000	
511022	ARALDIT HAERTER HV 953 U	00	15	0.000	
255038	KENNZEICHNUNG LABEL 21X9 WEISS	00	16	1.000	
255042	WARNZ. BIOGEFAEHRDUNG	00	17	1.000	
255618	WARNZ. BEWEGTE TEILE	00	18	1.000	

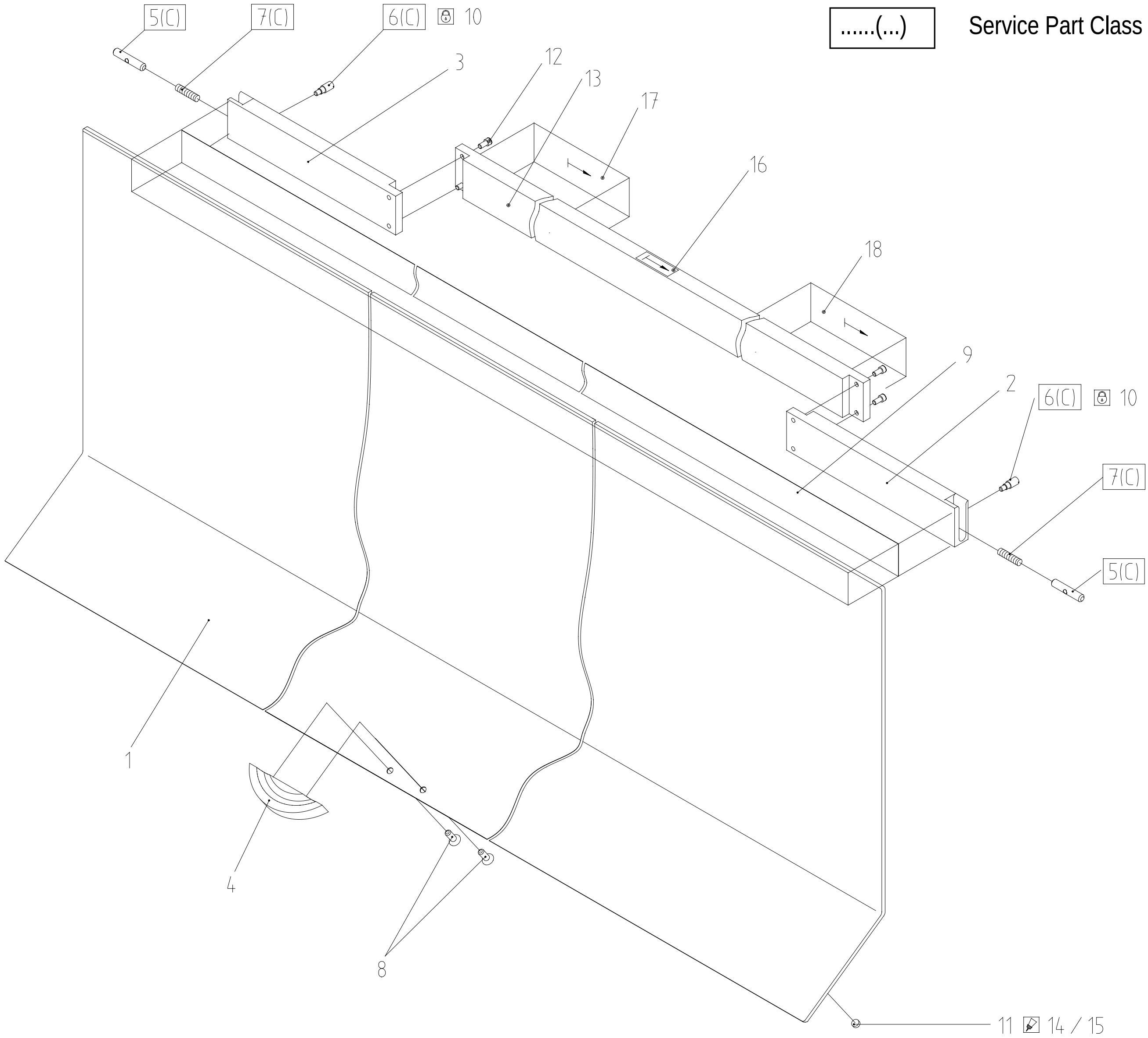
TRANSPARENT COVER (LARGE, for 24 / 30) 147922 Revision:00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
148154	SCHUTZGLAS LANG LACK.	00	1	1.000	
147951	QUERSTREBE LINKS	00	2	1.000	
147952	QUERSTREBE RECHTS	00	3	1.000	
147950	HANDGRIFF	00	4	1.000	
147954	ARRETIERBOLZEN	00	5	2.000	C
147955	GRIFF FUER ARRETIERUNGSBOLZEN	00	6	2.000	C
256120	DRUCKFEDER ROSTFREI 0.4MM	00	7	2.000	C
403493	SENKSCHRAUBE M 4X12 DIN7991	00	8	2.000	
7281118	KLEBSTOFF-FILM ISOTAC	00	9	1.060	
511006	LOCTITE 222 50mL	00	10	0.000	T
281115	SCHEIBENMAGNET 5X2 MM	00	11	1.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	12	4.000	
148238	VERSTEIFUNGSSTREBE LANG	00	13	1.000	
511021	ARALDIT HARZ AW 106	00	14	0.000	
511022	ARALDIT HAERTER HV 953 U	00	15	0.000	
255038	KENNZEICHNUNG LABEL 21X9 WEISS	00	16	1.000	
255042	WARNZ. BIOGEFAEHRDUNG	00	17	1.000	
255618	WARNZ. BEWEGTE TEILE	00	18	1.000	

6.5.3 **3D Drawing** Transparent Cover Dwgs:

sm 147 920, md 147 921, lg 147 922.

dwg. revision 00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Service Part Class
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11 ✎ 14 / 15

Waste Cap

148 335

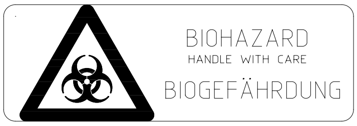
- Functional Description
- Replacing Spare Parts
- Spare Parts List
- 3D Drawing

6.6 Waste Cap

6.6.1 Functional Description

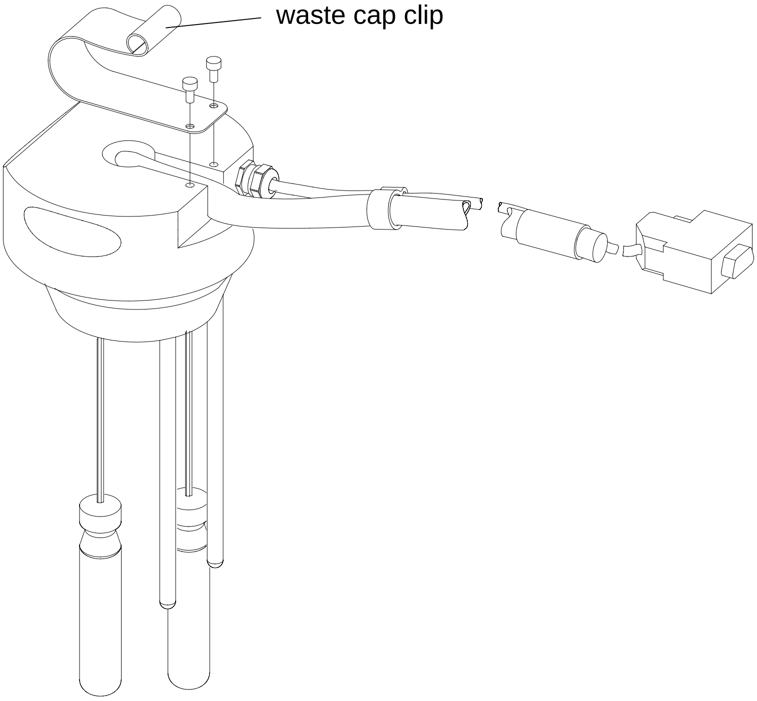
- ❒ Closing of waste container
- ❒ A hall sensor detects if the waste tube clamp is open or closed
- ❒ Liquid level detection in waste container

6.6.2 Replacing Spare Parts



6.6.2.1 Silicon tube 8x12 item 15

1. Remove waste cap clip.
2. Insert 2 hex screw drivers into the two holes provided to open waste tube clamp (item 3).
3. Pull out the tube and remove the spring (item 22).



Remounting

1. Replace the tube and reinstall the spring (spring prevents tube from kinking).
2. Reinsert the tube and allow it to protrude 5 cm (2 $^{1}/_{2}$ inches) from the bottom of the waste cap body. Remove the screw drivers.
3. Attach waste cap clip.

6.6.2.2 Cable W51 item 2

1. Remove the silicon tube as described in section 6.6.2.1.
2. Unscrew strain relief nut.
3. Push silicone tube and cable into waste cap cover before carefully opening waste cap (4 screws item 10).

Remounting

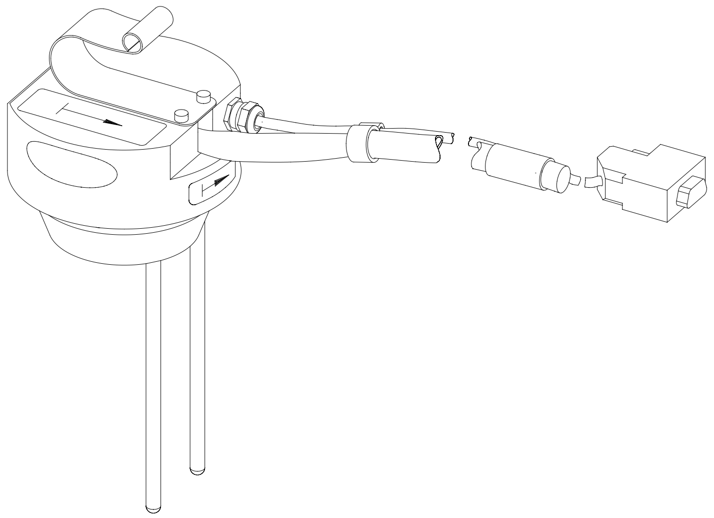
1. Properly position *gasket (item 5)*. Gently pull cable while closing the waste cap cover to ensure wires do not get pinched.
2. Reinstall the waste tube.

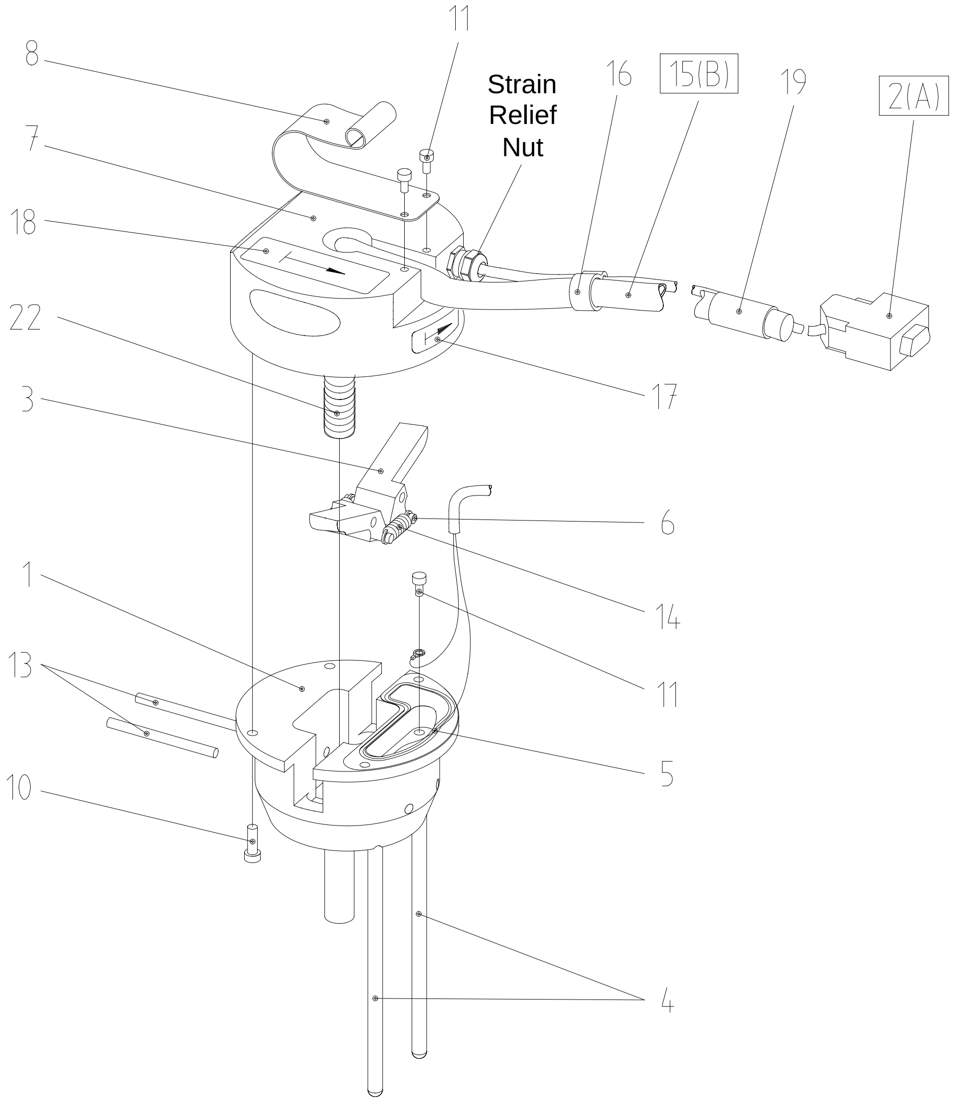
6.6.3 Spare Parts List

WASTE CAP 148 335 Revision: 00

P/N	DESCRIPTION	REVISION	ITEM NUMBER	QUANTITY PER ASSEMBLY	SPARE PART CLASS
148328	UNTERTEIL	01	1	1.000	
146301	CABLE W51	01	2	1.000	A
148330	KLEMME	01	3	2.000	
148343	SENSORSTANGE	01	4	2.000	
148342	DICHTUNG	00	5	1.000	
148336	FEDERHALTER	00	6	2.000	
148329	DECKEL	00	7	1.000	
148353	ARRETIERFEDER	00	8	1.000	
400262	ZYL-SCHR.M 3X 6 DIN912 A2	00	9	2.000	
400304	ZYL-SCHR.M 4X12 DIN912 A2	00	10	4.000	
400263	ZYL-SCHR.M 3X 8 DIN912 A2	00	11	2.000	
281155	ZYL-STIFT 4h8x50 A4	00	13	2.000	
256126	ZUGFEDER D=0.9 DI=6.3 LO=17.1	00	14	2.000	
7260010	SILIKONSCHL 8 X12 TRANSP	00	15	1.750	B
361034	KABEL HALTER SCHWARZ	00	16	5.000	
255037	KENNZEICHNUNGS LABEL 30 X 12	00	17	1.000	
255042	WARNZ. BIOGEFAEHRDUNG	00	18	1.000	
7353011	SCHRUMPFSCHL. RNF3000 4/12	00	19	0.010	
281099	MG VERSCHL.-BEUTEL 220x305	00	21	1.000	
256127	DRUCKFED d=1 Dm=13 Lo=54	00	22	1.000	
255385	IDENTIFIKATIONSLABEL ORANGE	00	23	1.000	
511030	SICOMET 77	00	24	0.000	

6.6.4 3D Drawing Waste Cap: Dwg. 148 335 revision 03

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Strain Relief Nut
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2(A)
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